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ON THE EXPLOSIBILITY OF PETROLEUM OIL.

BY A. NORMAN TATE, F. C. S.

The explosibility of the American rock-oils or petroleum is probably a subject of interest to many of the readers of the "Pharmaceutical Journal," as the oils are largely sold as lamp-oils, and as such are dealt in by some chemists and druggists.

These oils give off at different temperatures an inflammable vapor, which forms with the air an explosive mixture. With one or two exceptions, all the crude oils as imported from America, that I have examined, gave off such vapor at ordinary temperatures, and must, therefore, be considered highly dangerous. But I have lately examined several samples of the oils as sold for illuminating purposes, and have found that they exhibit a great difference in the temperature at which they give off inflammable vapor.

The following table shows the results I have obtained from the examination of twelve samples, purchased in Liverpool and Birkenhead:

No. 1 evolved inflammable vapor at	87°	Fahr.
" 2	120°	"
" 3	87°	"
" 4	135°	"
" 5	110°	"
" 6	90°	"
" 7	115°	"
" 8	96°	"
" 9	60°	"
" 10	140°	"
" 11	120°	"
" 12	100°	"

Of these samples not more than six can be considered perfectly safe: these are numbers 2, 4, 5, 7, 10, and 11. Number 9, which evolved inflammable vapor at as low a temperature as 60° Fahr., is highly dangerous; and numbers 1, 3, and 6, which yielded vapor at 87° and 90°, as they are liable to be exposed to such temperatures in lamp-cisterns, must also be considered unsafe. The samples numbers 8 and 12, explosive at 96° and 100°, may in most cases be put down as safe, for as a rule the temperature of lamp-cisterns does not exceed 90° Fahr.; but under certain circumstances, to which it is possible a lamp may be exposed without being thought in danger, the cistern may become heated above 90°; therefore these samples (8 and 12) cannot in all cases be considered safe.

It is much to be regretted that oils which yield inflammable vapor at lower temperatures than 100° Fahr. should be sold as lamp oils, as they are, without doubt, very dangerous, and accidents have already occurred from their use. The rock oils when properly refined (as for instance numbers 4 and 10 in the above table) may be used as lamp oils without any danger of explosion; they give a brilliant light, and their cost is so low as to bring them within the reach of the poorest classes.

With regard to the storing of the oils mentioned in the foregoing table (with the exception of number 9) no danger can arise from escape of vapor in any ordinary warehouse or store-room, as the temperature of such places would certainly not rise as high as 87° Fahr. Such oils, however, as number 9, and the crude petroleum, should never be stored except in a thoroughly well ventilated place, so that the vapor evolved may not accumulate, but be carried rapidly away; and a lighted candle, lamp, etc., should on no account be allowed in the warehouse or store in which they are placed.—*London Pharmaceutical Journal.*

LEGAL RECORD.

THE LOCKHAVEN, PA., GAS AND WATER COMPANY—APPLICATION FOR A RECEIVER.

Supreme Court of Pennsylvania at Nisi Prius—In Equity—JUSTICE READ.

Mackey *vs.* The Lockhaven Gas and Water Company. This was an application on the part of complainant, trustee under a mortgage, alleged to have been executed by the company to secure the payment of certain bonds alleged to have been issued by it for the appointment of a receiver. The bill and affidavits set out the incorporation of the company, the execution of this mortgage, the issue of the bonds thereunder, and that since July, 1859, no interest has been paid, and since July, 1861, when it became due, no part of the principal debt has been cancelled; that the company has been deriving a large revenue from the sale of gas to the citizens of Lock Haven, none of which has been applied to the payment of either principal or interest, and that it is insolvent, and unless a receiver is appointed, creditors will suffer loss. It also prays that an account of the income of the company may be taken, that the property, consisting of gas-works, machinery, &c., mentioned in the mortgage, shall be sold, and a receiver appointed.

No answer has been filed to the bill of complaint, the present application being made before that could be done, but the affidavit of the secretary of the company, in opposition to the averments of the bill, was presented and read this morning. It sets out that the complainant has sued out a *sci. fa.* on the mortgage in the Court of Common Pleas of Clinton county, which is now pending; that an affidavit of defence has been filed in that case, setting forth that the mortgage referred to in the bill was executed by unauthorized parties and not by defendants, and no such bonds as are therein described were ever issued by defendants. That the alleged mortgage and bonds are signed D. K. Jackman, president, C. S. Mayer, treasurer, and the mortgage is acknowledged by them as "*their act and deed.*" That at the time they executed these papers they were not the owners of a single share of stock, having previously assigned all they held to Berkenbine & Mears, who, at the date of the mortgage, were the exclusive owners of the whole stock, and, at this time, no election for officers had been held by the stockholders. That by the terms of the charter of the company it was authorized, "if *necessity required*," to borrow any sum of money, not exceeding $10,000, to be applied to the prosecution of the works of the company, and to pledge their property and franchises as security for the same; but that, at the time of the execution of this alleged mortgage, no such necessity existed. That no money was ever borrowed or received by the company as consideration for this mortgage, but it was executed by Jackson and Mayer for the purpose of being given to Berkenbine & Mears, upon their returning to the treasurer $10,000 of the stock of the company, which was to cancel. That the business has been carried on in a careful and economical manner, the property is in reasonably good repair, and the income has been applied to the current expenses in manufacturing gas, and in supplying the same to the citizens of Lock Haven: and that the appointment of a receiver would be ruinous to the interests of the company.

Counsel for the company stated that he had no affidavit denying the insolvency of the company, because that was not alleged in the bill, and he was not aware of its being in the affidavit, but that affidavits could be exhibited to the Court showing it to be in a solvent condition.

Justice Reid said that the affidavits presented very contradictory facts, and that the acknowledgment of the mortgage was a very singular one. He would prefer postponing the hearing until Saturday next, at which time the original papers could be produced. The case then went over. O. W. Davis, Esq., appeared for complainant, and Alfred S. Letchworth, Esq., for defendant.

PRICE OF GAS IN PHILADELPHIA.—The Philadelphia *Press* has the following item respecting the price of gas in that city: Gas bills at present are reduced one-ninth of the whole amount, with an additional national tax of fifteen cents per every thousand feet consumed. The one-ninth deduction is allowed upon all bills paid within five days after presentation, or being left at the house of the consumer.

The Trustees of the Gas-Works, in the sole view of meeting the national tax, so that it would not be onerous upon the consumers, made the arrangement to allow one-ninth discount, which is equivalent to furnishing gas at two dollars per one thousand feet, being twenty-five cents less than the previous rate.

The national tax is fifteen cents on every thousand feet, which, after calculation, will be found to nearly balance the old arrangement of five per cent. discount on the whole amount—a bill for one thousand feet at $2.25 would yield an abatement of eleven cents, making the net amount to be $2.14. Under the new arrangement, one-ninth of the whole amount, twenty-five cents, is thrown off, and the national tax of fifteen cents is added. This, it will be seen, only adds four cents per thousand feet to consumers, while at the same time they are contributing to the support of the National Government.

We learn that the coal contractors are bringing considerable pressure to bear upon the trustees to relieve them from their contracts, because there has been an advance in the price of coal. How they will succeed remains to be seen.

UTILIZING WASTE HEAT.—An invention for utilizing waste heat has been recently patented in England by a Mr. Joseph, of Wales. It consists in constructing a large retort built up of fire brick, or other suitable material, and surrounded by an outer shell of the same, so that a space may be left all round the retorts, the ends of the latter passing through the ends of the enclosing structure, and being provided with suitable doors. In order to support the retort, he forms piers of fire-brick, or other suitable material, underneath the same. This retort-oven he employs either for making, coke, charcoal, or for any other similar processes. At or near the top of the retort, he forms suitable openings, through which the combustible gases formed inside the same by any of the above mentioned processes pass into the surrounding space. He introduces small jets of atmospheric air, and thus causes the complete combustion of the combustible gases, thereby creating an intense heat. The hot products of this combustion by preference he employs for generating steam, making illuminating gas, firing pottery, heating drying stoves for general purposes, for calcining ores, for burning bricks, or for burning lime in kilns.

STANTON'S FORTE.—Every man has his *forte*. Stanton's is Fort Lafayette. There is no *piano* to that *forte*.

PAPERS ON HYDRAULIC ENGINEERING.

By Samuel McElroy, C. E.

No. 3.—Pumping Engines.

[From the Journal of the Franklin Institute.]

(*Continued from page* 164.)

For small pumps and moderate lifts, the use of "conical seat," "butterfly," "clack," or other light valves is admissible; but in heavy work it is important that the valves should give the largest possible channel of delivery, should open freely, should seat accurately, and be heavy enough to work down near the seat before the return stroke occurs. This feature of a pump deserves great care in arrangement, and exerts an important influence on the engine, and is more fully attained with the "double beat" than any other valve. All valves should be protected from accident on account of interception by chips or other foreign substances, by carefully flooring the pump-wells, and placing copper wire screens on the entrances, at such distance from the pumps as will obviate additional friction in supply. Flooring a well is also of service in preventing the effects of evaporation in the engine-room on the bright-work. Those who are curious to see the operation of an umbrella over an engine, will find one in the engine-house of the New York Navy Yard, the idea being original with one of the retired Commodores, and therefore not patentable.

Suction Lift.—It is customary to locate pumps rather with regard to convenience of position or of foundation, than any special attention to their action on the lower lift. It is considered a matter of little consequence what their relative level to the well may be, the preference being generally expressed for a short lift; but there are certain conditions of location, in all cases where location is not absolutely controlled, which seems to reverse the correctness of this general practice in illustrating an ancient and overlooked doctrine.

The Torricellian theory, which is an established doctrine of natural philosophy, has demonstrated that if a vacuum be found in a tube connected with a body of water, by virtue of atmospheric pressure, the water will rise to such height as corresponds with its specific gravity and a certain barometric state of the atmosphere, which height is limited, in certain latitudes, to 35.1 feet, and is usually assumed at 33.8 feet, or an equivalent pressure of 14.7 pounds per square inch.

It is evident that if the base of such a tube is closed by a cock, and the vacuum is made with an air-pump, that the difference in atmospheric pressure in a height of 33.8 feet is so slight in practice, we may assert that it costs precisely the same mechanical work to produce this vacuum, either at the base, the middle, or the top of the tube. If the cock be opened, the tube is immediately filled, and the greatest load which can be shown in it by an indicator or vacuum gauge cannot exceed 14.7 pounds per square inch. It is certain that this load will be represented at the upper level of the water; if the atmospheric pressure on the water surface of the well is the same, plus only the difference due to 33.8 feet of its height of some forty miles, it is evident that the same gauge will show the same load at the base of the tube.

If, in consequence of rarefaction of the air contained in the water, or imperfections of the air-pump or tube, the vacuum is imperfect, the column of water will rise to a less height because the external pressure is in part balanced; but in this case, the gauge will indicate the difference in load whatever may be its position on the tube at the top, the middle, or the foot, and for the reason that the column of water is *in equilibrio* at each point of its elevation with the atmospheric column which sustains it. The equilibrium would be instantly changed if the lower valve of the tube were closed and the upper part opened to the atmosphere; in that case the atmospheric pressure would balance itself on the gauge, and at the middle or foot of the water column it would show a plus pressure, equivalent to the relative height of water above its piston; but so long as the tube is *in vacuo*, the minus pressure will be the same at any point of its height.

If we take the case of a piston moving in such a tube with an open top, packed air-tight, and starting from the water surface, the water will follow it to a height of about 33.8 feet, and the load on the piston can in no case exceed 14.7 pounds per square inch, which will be its load at the maximum height. Now, if we reverse the analysis, we find that if, by any influence of dynamic laws, such a piston in motion creates a perfect vacuum at any point below 33.8 feet, it is performing a certain amount of work in excess of the balance of the atmospheric column, and is wasting power in proportion to its travel under such vacuum.

All suction pistons work against an atmospheric load equivalent to the perfectness of their vacuum, and are supplied by a column of water lifted by an external, independent, counterbalancing force. If it should appear, then, that the vacuum to be produced by pumping action may be very seriously independent of the height of a pump, the question of location becomes important in the matter of economical work, and it is essential to make the universal, superincumbent, atmospheric load as useful as possible within its prescribed limits. The whole argument of the Torricellian theory is in favor of high lifts.

On the other hand, the theory of present practice asserts, that in all lift and force pumps, the piston bears a load equal to its area, and the weight of a column of water as high as the difference of level between the surface of the well and the point of delivery, without special regard to the relative height of the suction column.

We hold, then, that an important theoretical distinction is to be made between the upper and lower sides of any lift and force piston, in view of this law. The superincumbent load is represented by the pressure of the atmosphere, the friction of valves, piston, and water column, and the inertia of the latter, while the condition below the piston is represented by the perfection of the vacuum produced. The vena-contracta of the tube, valve friction, and inertia of the suction column, affect its relative height and velocity of influx, and are to be specially referred to the external atmospheric pressure which overcomes them in its effort to equilibriate the controlling vacuum. Strictly speaking, the mechanical work of such a piston is determined by its upper load entirely, if we include in it that part of the atmospheric load, unbalanced by the imperfections of the vacuum beneath it.

The mechanical effort of the atmosphere brought into action by the pump, and measured by the pump vacuum, is exerted in overcoming the inertia of a body of water, at each stroke, equivalent to the piston area and travel, and the attendant frictions of supply. To the effects of such friction in loss of head, are to be added such losses or counterbalances as occur from leaking joints, rarefactions of air in the water column, barometric oscillations, and otherwise; we have also to make the stroke within the limit of height controlled by these losses, so that the maximum lift cannot in practice be carried up to the theoretical level; but the effects of this dynamic action, as we propose to show, not only contravene the received theory of action, but evidently justify a change of practice in certain cases.

All such pumps in established action work in more or less solid water, and should not, of course, be started at speed until properly charged above and below; precautions to this effect are always taken by careful engineers; and therefore, so far as water supply is concerned, with any full tube, and with a reasonable margin for the deductions of height we have noticed, there is no more danger of loss of charge at one lift than at another. This is not a serious contingency in any case of proper arrangement and workmanship.

To illustrate this question reference is made to—

Plate I. of Suction Pump Cards annexed, in which three pumping engines are represented, two of which are single-acting, and one double-acting, with different speeds and lifts.

The first card is taken from a plunger pump under a head of 3.5 feet, when the plunger commences its lift; but instead of showing an equivalent load, the indicator opens with a vacuum of over 3 pounds, which in the first foot travel increases to 6.25 pounds, the average load of the stroke being 4.25 pounds, equivalent to 9.77 feet, although the actual average lift is but three feet above the well. In this case the plunger diameter is 30 inches, the suction valves, double-beat, 43 and 39 inches in diameter, and the actual speed 94.5 feet per minute.

The second card is also from a plunger pump which rests 8.15 feet above its well. Here the indicator opens with a load of 8 lbs., equivalent to 18.4 feet, which increases in the first foot to 10.5 lbs., and continues with an equivalent lift of 24.84 feet up to the seventh foot of the travel. The average lift is 21.48 feet, the actual average lift being 13.61. In this case the plunger is 34.75 inches diameter, with a double-beat valve in the same barrel, and a speed of 64.3 feet per minute.

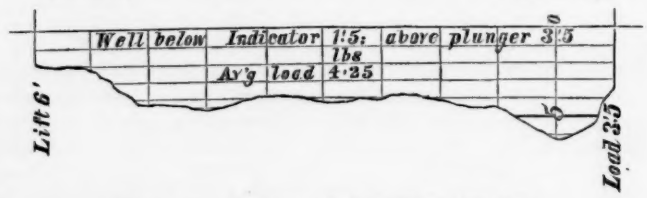
In the third card, taken from a double-acting pump, the piston commences its lift with a load of 7.5 pounds, equivalent to 17.25 feet, the actual lift being 10.58. Before the first foot is traveled the load increases to 9 pounds, or 20.7 feet; the average load is 7.62 pounds, or 17.52 feet, the actual average being 15.51 feet. In this case the diameter is 36 inches, fed by double-beat valves of 36 and 54 inches, the speed being 105.6 feet. The relative daily delivery of the engines of the second and third cards, was 3,287,860 and 14,418,641 gallons, under total heights of 158.83 and 160 feet, through tubes of the same diameter.

In the first card the conditions of free delivery to the plunger barrel are exceedingly favorable, since there is a head of 3.5 feet, and there are very large suction valves, with a short passage from the forebay; yet, as we see, to start the column and maintain its flow, required an initial load of 14.37 feet in addition to that of the head, or about 16.37 feet at the first foot of travel. It was necessary, in other words, to create a vacuum to this extent, under the special conditions of work, and the inference is, that the entire extra lift thus exerted below the plunger, is lost in useful effect

SUCTION PUMP CARDS.—*Motion, Right to Left.*

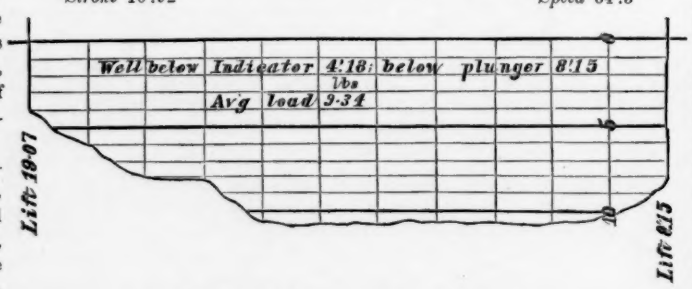
CORNISH ENGINE.—PHILADELPHIA.—June 19, 1856.

Stroke 9′.5 *Speed* 94.5



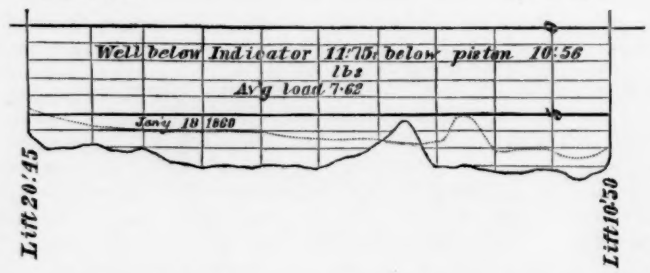
CORNISH ENGINE, BELLEVILLE.—J. C. W. W.—Dec. 20, 1856.

Stroke 10′.92 *Speed* 64′.3



UPPER PUMP, BROOKLYN ENGINE.—Dec. 23, 1859.

Stroke 9′.87 *Speed* 105′.6



to the engine, which has to repeat it on the forcing stroke.

In the second card we see that to effect the stroke supply, required a maximum load of 24.84 feet, as distinct from the actual average lift of 13.61 feet. Here is then a second proof that the pump is badly located.

In the third card the maximum lift is 20.17 feet, the actual average being 15.51 feet; and the lesson taught in general is, the unquestionable advantage of a high suction lift, when we remember that the forcing lift is dependent on the relative level of the pump to the discharge.

This inference is correct on the basis that the indicator, when attached to a tube *in vucuo*, represents correctly the atmospheric effort to meet the demand of the plunger or piston, whatever its relative position to such piston. It will be seen, however, by reference to published reports of pumping experiments, that the vacuum gauge is generally treated as if under the same conditions as a pressure gauge. At Philadelphia the card was modified by a deduction of 5 feet, equivalent to the water load and its level above the water, and at Belleville, the relative depth of the vacuum gauge below the force-main gauge, was credited to the pump. If the experts were correct, it is still evident that the nearer the suction piston can be carried to the level of maximum atmospheric balance, since the maximum load is fixed at about 33.8 feet, the better.

Another consideration flowing from a very plain law is important in suction tubes. It will be noticed in these cards, as in all other correct pump cards, in like principle, if not in the same degree, that the common theory of relative load is reversed, since the maximum is encountered at or near the commencement of the stroke, when the plunger is lowest, and the minimum at the point where the plunger is highest. In the first card the final load is 4 pounds, in the second card 3.8 pounds, and in the third card 3 pounds, less than the maximum initial load, instead of being regularly increased with increased lift. This is the effect of the *vis viva* of the suction column, which increases in power from the moment in which the initial atmospheric impetus overcomes its inertia; and the curves in the line traced by the indicator pencil, show the oscillations of this column, as affected by difficulty or velocity of influx, and the promptness with which the initial effort is relieved.

This furnishes a second demonstration of the doctrine that the mechanical work of the piston is controlled chiefly by other conditions than that of relative level above the well, viz.: by the freedom of influx to the pump chamber, and the dynamic movement of the column started by the pump.

It is plain, then, that the maximum useful effect of the suction side of the pump piston, is determined by the greatest elevation above the well consistent with the allowances due to barometric oscillations and imperfections of mechanism, and that the character and operation of delivery valves, form and length of supply tube, and speed of piston, are of great consequence to such effect. And it is also plain that the most judicious arrangement of appurtenances may be vitiated by an injudicious location of the pump.

In the single-acting engines noticed, as in all others of their special class, the steam-stroke of the engine makes the plunger lift, the return stroke being made under the pressure of a counterweight. Consequently the suction valve must be closed when the return stroke begins, and the *vis viva* of its column counteracted. Velocity cards, we have taken from the Philadelphia engine, show a relative speed of the ascent 18 per cent., hark 12 per cent., descent 70 per cent. of the entire double-stroke; at Belleville the descent was about half the speed of the ascent; but the speed is in neither case unfavorable to proper action; in the first card the influx evidently anticipates the action of the bucket. Here all the benefit of the *vis viva* of the column, at the instant when the valve closes on it, is not only lost, but it tends to increase the initial load on the return stroke by the force exerted to close it before the delivery valve opens to the main.

But in the case of the Brooklyn engine, which is double-acting, and in which the upper and lower pumps alternately relieve each other, this effect is not lost, since the line of motion is not counteracted, and the benefit is important as to the initial lift of the succeeding stroke and as to the loss of action of the pump. The relative variations in load are less than in the other cards, and were much improved in smoothness of action by subsequent improvements to the engine, which will be noticed under their proper head, and appear in the dotted line marked Jan. 13th, 1860, a fact which is remarkable, when the enormous difference in amount of water pumped in a given time is considered.

It may also be observed, that since the atmospheric effort to meet a vacuum produced by the abrupt motion of a piston, is retarded by all the causes which obstruct a flow of water in tubes, and a loss of mechanical effect occurs in this ratio, all contracted tubes, abrupt bends, imperfect valves, and the like, are to be avoided, with all counteractions in line of flow.

The general conclusion we present is this: that inasmuch as the vacuum produced in practice by pump motion is always in excess of the static load of an hydraulic column equivalent to its piston level, and inasmuch as the limit to this vacuum is fixed, the greatest mechanical effect in suction will be realized by the highest upper centre of piston stroke, consistent with perfection of workmanship and arrangement, and that the conditions of action are different on different sides of any suction and force-lift piston, and are independent of the relative height above the well to a greater extent than is commonly assumed.

Among other practical illustrations, which might be adduced on this point if space permitted, the relative locations of engine condensers, as to their supply wells, in stationary engines, and as irrelevant to the perfection of their vacuum, will be sufficiently familiar and suggestive.

(To be concluded.)

PETROLEUM GAS.

The London *Times* roughly estimates that the quantity of Petroleum or Rock Oil which will be exported to Europe in 1863 will amount to fifty or sixty million gallons. Numerous uses for the different light and heavy oils, which can be procured from petroleum by distillation, are already known, and application is now made of this curious product in a great number of forms. But it is as an illuminator that it will find most favor with the public, where the supply is constant and cheap; and it is very probable that, as an economical source of gas for illuminating and heating purposes, it will rapidly come into general use.

The results of a series of experiments which have recently been made at the gas-works from which the small towns of Homer and Courtland, in the State of New York, are supplied, are most satisfactory and encouraging, both with regard to the luminous qualities and the remarkable cheapness of petroleum gas.

The following details are the results of careful measurement in all particulars, from which information as to the economy of the manufacture of petroleum gas could be derived.

The retorts at Homer are two in number, and of the following dimensions:

Length	7½ feet.
Breadth	16 inches.
Height	12 "

Two vertical tubes are cast on each retort for the purpose of supplying water and petroleum. The retorts are laid horizontally in an arch, exactly the same as ordinary coal gas retorts, for which they can be substituted without much trouble or expense. Each retort is divided into three chambers called the petroleum, the water, and the coke chambers respectively.

Petroleum and water are introduced in continuous streams through the tubes before described, so that when once a barrel of petroleum is placed at a sufficient height to allow a pipe provided with a stop-cock to feed the retort, the fluid may be admitted and the process of conversion into gas goes on without further trouble, until the barrel is exhausted.

Two series of experiments were recently made at Homer, with the following results:

FIRST TRIAL.

Quantity of gas made by each retort, per hour, 450 cubic feet.
Total quantity of gas made, 3,380 cubic feet.
Petroleum consumed, 38 wine gallons.
Condensed petroleum, capable of being used over again, 4 gallons.
Quantity of petroleum per 1,000 feet of gas, $10\frac{1}{17}$ gallons.
Time required to make 3,380 feet, 3 hours 45 min.
Time of heating the retorts; the same as for coal gas.
Quantity of fuel; same as for coal gas.

SECOND TRIAL.

Quantity of gas made by the two retorts in the first hour	C. F. 1,080
Quantity of gas made in second hour, less 10 minutes	820
Proportionate quantity in second hour	984
Total quantity in two hours	2,064
Mean quantity per hour	1,032
" " for each retort per hour	516

Quantity of fuel; same as for coal gas.
Time of heating retorts; same as for coal gas.
Quantity of petroleum consumed..... 25 wine galls.
" condensed petroleum, capable of being used again..... 1¼ "
Actual quantity of petroleum used..... 23¾ "
Quantity per 1,000 feet..... $11\frac{9}{10}$ "

MEAN OF THE TWO EXPERIMENTS.

Total quantity of gas made, 5,280 cubic feet.
Total time occupied in making the gas, 5 hours 35 minutes, or very nearly 1,000 feet per hour, of 500 for each retort.
Petroleum consumed; 11 gallons per 1,000 feet.

In the first hour of the second experiment, the quantity made was 1,080 cubic feet; and the condenser showed that too much water was admitted, (about one-eighth of the whole quantity of petroleum.) This unnecessary quantity of water evidently cooled the retort, and prevented the gas from being formed so rapidly as during the first trial.

A one-foot burner, with this gas, gives as brilliant a light as a four-feet burner supplied with common coal gas.* Hence, 1,000 feet of petroleum gas will go as far as 4,000 feet of ordinary coal gas for illuminating purposes.

Now, when we examine these results, and compare them with what has been done in the manufacturing of coal gas, the following remarkable comparisons present themselves.

In making coal gas a charge of 150 lbs. of coal is generally introduced into the retort, and allowed to remain for five hours. It generates 600 feet of gas, if the coal is of moderately good quality. This is at the rate of 8,000 feet, for 2,000 lbs., or one ton of coal. To produce 600 feet of gas, the destructive distillation has to be carried on for a period of five hours. In a retort of the same dimensions and heated in the same manner, no less than 2,500 cubic feet of petroleum gas are produced, under precisely similar conditions. But one cubic foot of petroleum gas is equal in illuminating power to 4 cubic feet of coal gas. Hence, in five hours the petroleum produces, when reduced to the equivalent of coal gas, the enormous quantity of 10,000 cubic feet of gas, against 600 by the coal process. The saving of fuel and labor is consequently enormous.

If we assume that the illuminating power of petroleum gas is only three times that of coal gas, the proportion of each kind produced in 5 hours is as follows:—
7,500 cubic feet of gas by the petroleum process.
600 " " by the coal process.

Hence, in this case, which is below the actual results, the GAIN IN TIME required for the manufacture of petroleum gas, as compared with coal gas, is as TWELVE to ONE. This fact alone reduces the number of retorts in petroleum gas works on a large scale, to at least, say, one-sixth of the number required for coal gas works. Actually one petroleum retort can produce the equivalent in gas of twelve coal gas retorts. When the annual expense of retorts is taken into consideration, this item alone establishes a great argument in favor of the petroleum process; for not only is the number of retorts required diminished to the extent named, but all connecting pipes, huge hydraulic mains, and the extensive system of coolers and purifyers, are dispensed with in equal proportion. The labor of handling the coal is done away with, and a large proportion of capital in the construction of works saved.

* A recent writer in the AMERICAN GAS-LIGHT JOURNAL states that petroleum gas gives a light 6 or 7 times as luminous as coal gas. This may be the case, but in order to avoid an error in excess, we place it at 4 times as great as ordinary coal gas: that is to say, a one-foot burner with petroleum gas, is equal to a four-feet burner fed with common coal gas.

To proceed now to the question of cost. Assuming that two benches, each containing two retorts, are used for making petroleum and coal gas respectively. The cost of apparatus in the first instance is about the same. The time for heating and the fuel consumed is the same. The cost of 11 gallons of petroleum (or 1,000 feet of petroleum gas) at 6 cents a gallon (the price in Toronto) is 66 cents. The cost of 250 lbs. of coal (or 1,000 feet of coal gas, at $5 a ton, is 62½ cents. But 1,000 feet of petroleum gas is, at the lowest estimate, equal to 3,000 feet of coal gas. Hence, the cost of 3,000 feet of coal gas (equal to 1,000 feet of petroleum gas) or 750 lbs. of coal, at $5 a ton, is $1.87½. Then there is the coke to be deducted from the price of the coal used in making 3,000 feet of gas, which may fairly be set against the smaller amount of labor required in handling the petroleum, when compared with the handling of the coal.

Where petroleum is 10 cents a gallon, and coal $6 a ton, the proportionate cost of the raw materials used will be as follows:

Cost of 1,000 feet of petroleum gas	$1 10
" 3,000 feet of coal gas	2 25

The foregoing comparisons refer to the original cost of the material from which the gases are made, but if we take the price actually charged by gas companies into consideration, the results are the more striking.

The cost of private works to supply 200 burners will be about $1,000; the labor of one man per diem; lime for purifying; three bushels of coke at 10 cents a bushel; so that the entire cost will be—

Interest on capital at 8 per cent. per ann.	$80 00
Labor at $1 per day	365 00
Lime for purifying, 200 bushels per ann. at 20 cents a bushel	40 00
Petroleum to produce gas for 200 one-foot burners, 5 hours a day throughout the year (365,000 feet of gas); 4,015 gallons, at 6 cents a gallon	240 90
Fuel, say 4 bushels of coke a day, at 10 cents a bushel	146 00
Total cost	$871 90

The equivalent of 365,000 cubic feet of petroleum gas in coal gas is 1,095,000, reckoning one foot of petroleum gas equal to three feet only of coal gas.

Cost of 1,095,000 cubic feet of coal gas, at $2 50 per 1,000 feet (a low price in the United States and Canada)	$2,737 50
Difference per annum in favor of petroleum gas	1,865 60

If the price of petroleum is 10 cents a gallon, instead of 6 cents, the difference in favor of the gas will be, per annum, $1,705.

Thus:

Interest on capital	$80 00
Labor	365 00
Lime	40 00
Petroleum	401 50
Coke	146 00
	$1,032 50
1,095,000 c. ft. coal gas, at $2 50 per 1,000,	$2,737 50
Diff. in favor of petroleum gas, per annum,	1,705 00

In works, where twelve coal gas retorts are in operation day and night, each being charged with 150 lbs. of coal, they can produce 36,000 cubic feet of gas in 24 hours. This quantity can be yielded by two petroleum retorts in twelve hours. Thus:

2 petroleum retorts yield 1,000 cubic ft. per hour.

In 12 hours the yield will be 12,000 feet.

The equivalent of 12,000 feet of petroleum gas is equal to 36,000 feet of coal gas.

If reduced to the same unit of time, namely, 24 hours, two petroleum retorts, of the same dimensions as coal gas retorts, will yield 24,000 cubic feet of petroleum gas, the equivalent of 72,000 ft. of coal gas, or as much as 24 ordinary coal retorts charged with 150 lbs. of coal each, every five hours, can produce in 24 hours.

There are other facts which make the production of gas from petroleum more economical than from coal. The quantity of lime required for purifying is not so great by one-half. The amount of water needed for cooling and washing is very considerably less, and the tar produced is small in quantity when the yield of gas is taken into account. The gas is more free from those noxious sulphurous compounds which render badly purified coal gas so disagreeable and prejudicial.

The destruction of retorts in the manufacture of coal gas is immense. This arises in a great measure from the formation of graphite in the inside of the retorts, which accumulates in concentric layers, and sometimes forms a coating one or two inches thick. The retorts also suffer to a great extent by the entrance of air when introducing the charge of coal. This source of rapid destruction is avoided altogether in the petroleum retorts, which do not communicate with the atmosphere when in a heated state, and only require to be occasionally opened to remove the deposited carbon or graphite, which, by the way, can very conveniently be removed by partially filling the petroleum chamber with fire brick, whereby the heated surface to which the rich hydrocarbon vapors are exposed is greatly increased, and their conversion into permanent illuminating gases much facilitated. The deposition of carbon is materially diminished by reducing the pressure of the gas on the retort, and this, by a simple adjustment of the water joints in the petroleum apparatus may be reduced to a minimum.

The use of water in the process by which the result described in the preceding pages is produced, is for the purpose of converting the volatile hydrocarbon vapors of petroleum into permanent gases. It is thrown into its spheroidal condition the moment it strikes the interior of the retort, and in this state its spheroids continually develope steam of very high temperature and great reducing power. The rich petroleum gas may be largely diluted by the formation of thé so-called water gas, but this has been shown to be an expensive process, and it is far more economical to employ a one-foot burner with a highly luminous gas than a three or four-feet burner with a diluted gas. The use of water gas as a diluent for rich hydrocarbon gases, which will burn without smoke or smell, and give a brilliant light from a small burner, is of not only very questionable economy, but it is thought by some to be a dangerous expedient, on account of the admixture of poisonous carbonic oxide into the gas, which, if leakage should by any accident occur in dwelling-houses, might be followed by those fatal results to human life which have occurred time and again in every country where coal-gas is manufactured, and particularly where water-gas is used either with hydrocarbons or in any other form. Water gas, in order to be economical, implies the conversion of the carbonic acid produced into carbonic oxid, the one being a feeble illuminator, the other not only an incombustible, but so prejudicial to illumination that one per cent. of carbonic acid in coal gas diminishes its illuminating power by 6 per cent. The use of water gas has been interdicted by several European governments, on account of the poisonous properties of the carbonic oxide it contains. In the petroleum process, only so much water is used as will ensure the conversion of the volatile hydrocarbon vapors into permanent gases by their reduction to a lower hydrocarbon condition; and an analysis of its constituents shows that it contains much less carbonic acid than common coal gas Its great illuminating power is deprived from a very large percentage of olefiant gas, together with carbonetted hydrogen.

Mr. G. Howitz, the manager of the Copenhagen gas-works, obtained 1,000 feet of water gas by the combustion of 140 lbs. of coke in the furnace, and about 20 lbs. of charcoal (15 lbs. pure carbon) in the retort. The water gas consisted of the following:

Hydrogen	64
Carbonic oxide	18
Carbonic acid	18
	100

M. Gillard and M. Isard, in France, make water gas by passing superheated steam over coke or charcoal; but by their process 1,000 cubic feet of mixed gases reqire 15 lbs. of pure carbon in the retort, and 118 lbs. of coke in the furnace.

1,000 cubic feet of water gas can be obtained theoretically from 27.4 lbs. of water, although in practice much more is used, as a considerable portion of the steam is passed over undecomposed.

The following are the results of Mr. White's process, compared with that of M. Gillard:

WHITE'S PROCESS FOR THE MANUFACTURE OF 1,000 FEET OF WATER-GAS.

Coke in the furnace	112 lbs.
Charcoal in retort (equal to 15 lbs. carbon)	18 "
Lime for purifying	37 "

GILLARD'S WATER-GAS (NARBONE).

Coke in the furnace	118 lbs.
Charcoal in the retort	18 "
Lime for purifying	67 "

The amount of fuel expended is not only very considerable, but the lime required for the abstraction of the carbonic acid is immense. When coal-gas contains 5 per cent. of sulphuretted hydrogen and carbonic acid, it requires only 15 lbs. of lime to purify 1,000 feet. But by the foregoing table White requires 37 lbs., and Gillard 67 lbs. of this material to abstract the carbonic acid from the same quantity of the water-gas.

The advantages possessed by petroleum gas as a cheap illuminator, have already been sufficiently established; but its claim to public patronage does not rest on this fact alone. It is a most economical and valuable source of heat. Coal-gas stoves have long been in limited use, but they have not met with general favor, because they do not supply a sufficient amount of heat, and they are besides too costly when the coal gas is maintained at $2 50 per thousand feet. Petroleum gas is admirably adapted as a source of heat. It contains a much larger proportion of carbonetted hydrogen than coal gas; but carbonetted hydrogen generates more heat during combustion than either the same measure of hydrogen or carbonic oxide, as the following table, deduced form Dulong's experiments, proves:—One cubic foot of carbonetted hydrogen, during its combustion, causes a rise of temperature from 60° to 80° in a room containing 2,500 cubic feet of air; whereas a cubic foot of carbonic oxide elevates the temperature of a room of 2,500 cubic feet from 60° to 66.6°, and one cubic foot of hydrogen raises the temperature of a room of the same cubical capacity as before stated, from 60° to 66.4°. Or in other words: a cubic foot of carbonetted hydrogen is capable of heating 5 lbs. 14 oz. water from 32° to 212°, a cubic foot of carbonic oxide 1 lb. 14 oz. through the same degrees of temperature, and a cubic foot of hydrogen 1 lb. 13 oz. of water from 32° to 212°. With a burner and apparatus of peculiar construction, and consuming six feet per hour, a petroleum gas flame from eighteen inches to two feet in length can be produced under the same pressure as is used for lighting purposes. The flame is almost destitute of luminous qualities, but the heat it emits is intense. It can be used for heating private dwellings, for cooking, and other domestic purposes. The cost of this gas fuel is, at the rate of one stove burning for 30 days, 10 hour a day, $1 30, when petroleum is 6c. a gallon; when it is 10c. the cost per month is $2. For two dollars a month, the house of a poor man may be supplied with light and fuel during ten hours of the day. With a burner of less dimensions —say 3 feet per hour—a cooking stove and a one-foot burner, supplying abundance of warmth and light for one room during 24 hours each day, may be fed at a cost of $2 a month. This, of course, is the price of the raw material alone. It is some consolation to reflect, that at a period when the price of fuel is rapidly rising in the United States and Canada, a means for affording the poor man cheap light and warmth has been developed by the discoveries of the rich stores of petroleum on the American continent.

After a perusal of this article, every candid reader will acknowledge that gas from petroleum, manufactured by the process described, is not only the most economical and agreeable mode of illumination which has yet been brought before the public, but as a cheap source of heat it may present its claim to the patronage and encouragement of the public, with the best prospects of general adoption.—*Journal of Board of Arts for Upper Canada.*

COLLAPSE OF A GAS-HOLDER.—We learn from the London *Builder* that a singular accident recently happened to a gas-holder in Halifax, England. A new gas-holder, 100 feet in diameter, and weighing 70 tons, was being tried with air, and owing, as is supposed, to the imperfection of the metal tank, one side of the gas-holder was caught, causing the immense body to break through the middle.

ON THE SULPHUR COMPOUNDS IN PURIFIED COAL-GAS, AND ON CRYSTALLIZED HYDROSULPHOCARBONATE OF LIME.

By the Rev. W. R. Bowditch, F. C. S.

[*From the Transactions of the Royal Society.*]

The following facts relative to sulphur in what is called purified coal-gas, are additional to those already submitted to the Royal Society.

When I first made known the action of heated lime upon coal-gas, chemists accounted for the phenomena observed by two assumptions:—1. That the sulphur compound decomposed was free bisulphide of carbon. 2. That the decomposition was due to a reaction between water and bisulphide according to the following equation:

$$CS_2 + 2HO = 2HS + CO_2.$$

It was easy to show that these assumptions were erroneous, but exceedingly difficult to demonstrate the truth.

That the sulphur in gas does not usually exist as free bisulphide of carbon is proved thus:

Gas which has been purified at the gas-works by lime, and which contains 20 or 30 grains of sulphur in 100 cubic feet, may be passed for a considerable time through a tube containing cold slaked lime without producing discoloration; but, if the same gas be charged with a minute quantity of bisulphide of carbon vapor and passed through the same lime-tube, the lime becomes yellow and green from the decomposition of the bisulphide of carbon.

If, instead of passing the gas through lime, it be passed through triethylphosphine, the beautiful red crystals which this base gives with bisulphide of carbon are not formed; but, if the base be dissolved in alcohol or ether, and the gas passed through this solution, the red crystals are formed, as Dr. Hofmann first proved. The alcohol or ether dissolves out the bisulphide of carbon from the hydrocarbon compounds of which it forms a part; and, when it is thus dissolved it reacts with triethylphosphine.

Naphthalin, benzole, and other fluid hydrocarbons condensed from purified gas yield sulphide of hydrogen and other sulphuretted compounds by simple distillation, yet these do not produce the well-known red crystals with triethylphosphine. They may, moreover, be digested for weeks in an alkaline solution of oxide of lead without producing any sulphide of lead. Under similar treatment, bisulphide of carbon yields hydrosulphocarbonate and sulphide of lead in a few hours.

If the sulphuretted fluid hydrocarbons condensed from gas be mixed with ammoniacal alcohol and heated, and an alcoholic solution of acetate of lead be then added, a black precipitate is formed after some time, which evolves sulphide of hydrogen upon addition of an acid. In this case, neither hydrosulphocarbonate nor hydrosulphocyanide of ammonia is formed; yet it is well known that both are formed when bisulphide of carbon is added to ammoniacal alcohol. The erroneous view of the action of heated hydrate of lime upon the sulphur compounds in gas arose, I think, from the generally-received opinion that the blackening of lead salts by a gas is a proof that that gas is sulphide of hydrogen—joined to the fact that sulphide of hydrogen is one of the compounds produced by the action of the heated lime. If the sulphide of hydrogen had been separated from the mixture of gaseous compounds produced, the truth would have been apparent; but as, I believe, all experimenters have failed to separate them, the subject was obscure. After having failed in many processes devised by myself and suggested by others, I at last removed the sulphide of hydrogen, and showed that the blackening of lead salts is no proof of the presence of sulphide of hydrogen. Ordinary purified gas was passed over heated hydrate of lime, then through a considerable quantity of well-washed hydrate peroxide of iron, over lead-paper, and subsequently through moist slaked lime. The peroxide of iron was slightly blackened, and withdrew every trace o sulphide of hydrogen: the lead-paper became black, and the slaked lime yellow. This yellow lime gave a primrose-colored solution with water, which precipitated lead and siver salts brownish-red, thus showing the presence of impure hydrosulphocarbonate of lime.

To be certain of the absence of sulphide of hydrogen, some of the yellow lime was treated with hydrochloric acid, and the gases evolved thereby were conducted into a solution of potash. The potash solution gave no reaction with nitroprusside of sodium, showing the absence of sulphide of hydrogen, and when boiled with nitric acid gave no precipitate with a salt of baryta.

The hydrochloric solution of the lime contained a sulphur salt, which was obtained as sulphate of lime when nitric acid was added and the whole was boiled.

The blackening of the lead-paper in this case could not be due to sulphide of hydrogen, as that compound was absent. Nor, I think, is it due to the hydrosulphocarbonic acid which passed over, and in contact with, the lead-paper, and was arrested by the lime. The red compound which this acid produces with lead salts is said to turn black rapidly; and the red compound produced by a lead salt, and those of Berzelius and Zeise, undoubtedly does so blacken, as also does that produced by a salt of lead and an alkaline pentasulphide. I have, however, obtained a red lead salt by the reaction of crystallized hydrosulphocarbonate of lime and basic acetate of lead, which remains red after drying in the air at ordinary temperatures and exposure for weeks to the free atmosphere. I, therefore, conclude that the blackening of the lead-paper in the above case, was not due to hydrosulphocarbonic acid, but to some unknown or unsuspected compound.

In order to understand this matter fully, I commenced some investigations into the reactions of bisulphide of carbon with metallic oxides and other compounds, a portion of which I have now the pleasure of submitting.

Red Crystallized Lime-Salt.—Slaked lime and bisulphide of carbon are mixed in a close vessel, and allowed to stand for three or four days. The lime at first becomes of a pale primrose color, which gradually deepens to a fine lemon yellow. Water added to the yellow lime gives a solution of a gold color, which precipitates salts of lead and silver reddish-brown, and salts of mercury brown. These precipitates become black upon standing a short time. If the yellow solution be allowed to remain for a few days in contact with the lime, crystals are formed which will be very small, and so distributed through the line as merely to give it a fine salmon color.

This lime-salt is of a bright ruby color, and by the following process it may be obtained in beautiful crystals. Freshly slaked lime is to be mixed with so much water that, when stirred, it will aggregate into small lumps about the size of peas. These lumps are dried upon a sand-bath till they are hard, and will bear handling without producing powder. The lumps (quite free from dust) are placed in tubes *not more than an inch in diameter*. When the lime is cold, bisulphide of carbon is poured upon it in sufficient quantity to saturate the lime, and leave a few drops in each tube. The tubes are corked, and allowed to stand for three or four days. Water is then poured in carefully, so as not to remove any powder from the lumps of lime, and the tubes are closed and allowed to stand as long as the crystals increase in size. To obtain the crystals, the mother-liquor is poured off, the mass of lime, &c., is dried at ordinary temperatures, and the crystals are picked out. For success it is absolutely necessary that the lime should be in lumps, the vessel in which the reaction takes place of small diameter, and that undecomposed bisulphide of carbon be present.

Crystals so prepared appear to be perfectly permanent; they do not undergo alteration from several weeks exposure to atmospheric changes. I have not yet obtained them free from adhering lime, as all acids which will dissolve the lime decompose the crystals. They are soluble in water, but cannot be recrystallized from their solution. All the solutions I have yet tried decomposed without crystallizing. Other processes have equally failed to furnish a salt which can be obtained dry and pure; and I am, therefore, unable at present to furnish reliable concurrent analyses which will establish its formula.

I have not ventured an explanation of the reaction, because I am not yet acquainted with the compounds produced and their relative proportion. To ascertain whether an explanation based upon a reaction between the elements of water and bisulphide of carbon was tenable, I caused caustic lime to be heated to whiteness in a platinum crucible for two hours, and cooled out of contact with air. When cold, this anhydrous lime was saturated with dry bisulphide of carbon; and, in a short time, the lime became of a greenish-yellow color, showing the progress of a reaction between the dry lime and the bisulphide of carbon.

Some of the reactions of this salt are remarkable; and more than one will exhibit the liability to error from the use of any but the most perfectly crystalline, dry, and clean specimens. Baryta-water added in excess throws down from an aqueous solution of the *pure* salt an amorphous, red, insoluble precipitate quite as brilliant in color as vermilion. If this be washed directly after precipitation, the color is retained for a considerable period; but, if left in the mother-liquor it soon darkens. The washed salt dries a brick-dust red.

If, instead of the perfectly pure lime-salt, a solution of the salmon-colored compound, which is formed when the salt is prepared in large vessels and with powdery lime, be taken, a brownish-yellow crystalline double salt of baryta and lime is formed, which is very soluble in water.

Nitrate of baryta gives lemon-yellow crystals in a red-brown mother-liquor with solution of the salmon-colored mass, but an amorphous dirty grey precipitate in a yellowish mother-liquor with solution of the pure salt.

As soon as a quantity of the latter can be prepared, I hope to isolate the acid.

Salts of the oxides of barium, magnesium, strontium, silver, zinc, manganese, and chromium have been prepared by the direct action of the bisulphide of carbon Some of these differ considerably from the salts prepared by Berzelius by the action of the bisulphide of carbon upon the sulphides of the metals. The process which furnishes the lime-salt well crystallized will be tried with other compounds, and the results submitted to the Society.

A very offensive suffocating gas is evolved during the decomposition of bisulphide of carbon by lime, which is injurious, if not poisonous; and, having suffered severely from breathing this and other noxious compounds derived from the same source, I think it right to call attention to it. I have formed a gas of similar properties by passing bisulphide of carbon and hydrogen together through heated lime, and should not be surprised if it prove to be the long-sought simple sulphide of carbon.

Slightly ammoniacal alcohol breathed from a cloth appears to be the best restorative for the severe depression caused by respiring the offensive gases and vapors above named.

ON SULPHATE OF ANILIN.

BY WILLIAM PROCTER, JR.

The attention which has of late been given to the new dyes from coal tar products has developed much information on the subject of anilin, but the great pecuniary value which is placed on this information, in view of its use in the production of dyes, has prevented much of it from reaching the journals. At the last meeting of the British Association, Dr. Turnbull, of Liverpool, called attention to the sulphate of anilin as a therapeutic agent, and his short notice was transferred to page 232 of the last volume of the *Circular*. Having been applied to for information regarding this salt, the following notice has been prepared with a view of satisfying it in a measure.

In the continuations of the elaborate paper of M. E. Kopp, on the preparation of artificial coloring matters from coal tar, published in this journal for 1860, will be found his directions for its extraction from coal tar, and its artificial preparation from benzole, also a product of coal tar. See this journal, for November and December, 1860. The separation of anilin from coal tar direct is a very complex troublesome process, but when derived from benzole, although a tedious process, requiring considerable skill, yet it is by no means so troublesome. If the benzole is nearly pure, nitro-benzole is easily produced by causing small streams of strong nitric acid and benzole to meet in a funnel tube which passes through a vessel of cold water, so as to moderate the reaction. The resulting liquid should be washed first with water, then with a weak solution of carbonate of soda, and finally with water. I have found no difficulty in making it on a small scale by simply pouring slowly the two ingredients through a

small glass funnel, passing through a cork into a precipitating glass without any refrigeration, except that caused by contact with the vessel. The benzole used was obtained from Atwood & Co., Waltham, Mass., but benzole sufficiently pure for this use is now made in Philadelphia. As, however, nitro-benzole is an article of commerce under the name of essence de mirbane, or artificial oil of bitter almonds, it will probably be more easy to commence with this substance, which is transformed into anilin by several processes.

Preparation of Anilin.—Anilin is prepared from nitro-benzole—1st, by the action of sulphide of ammonium, on its alcoholic solution; 2d, by the action of nascent hydrogen when it is put in a vessel containing diluted sulphuric or muriatic acid and zinc, whereby that gas is slowly generated, gradually producing anilin, which combines with the excess of acid, and a resinous matter. The liquid thus obtained is saturated with caustic soda and distilled, when anilin and water are condensed. On trying this process it proved slow and troublesome and wasteful. 3d. Wöhler's process by the action of a hot alkaline solution of arsenious acid, the nitro-benzole being dropped in slowly, at once yields anilin, which distills over; when by precipitating it with oxalic acid and washed with alcohol, a pure oxalate results. 4th. The process of Béchamp (Annal. de Chim. et de Phys. serie 3d, xlii. p. 186,) by distilling together nitro-benzole, iron filings, and acetic acid, is suggested as the most eligible one for the pharmaceutist, with the proper precaution of using good materials and having thorough refrigeration to insure the rapid condensation of the vapors.

Take of Nitro-benzole.....1,000 grains.
" " Iron filings.....1,200 "
" " Concentrated Acetic acid....1,000 "

Put the iron filings and nitro-benzole into a quart tubulated retort, adapt it to a receiver, and connect the receiver by a bent tube with a deep small-necked flask, into which it reaches nearly to the bottom. Having well refrigerated the neck of the retort, the receiver and the flask, the last to be left loosely stopped with cotton, the acetic acid is poured in through the tubulure, which should be closed and tied. Reaction soon commences without the application of heat and becomes rapid, with quick rise of temperature and rapid ebullition, and a large portion of the products will be lost should the refrigeration be imperfect. The spontaneous distillate consists of anilin, acetate of anilin, and a little undecomposed nitro-benzole. When the retort has cooled these are returned to it from the receiver, and a careful sand bath heat applied until the residue in the retort is dry.

The distillate is now mixed with an excess of a solution of caustic potassa, when the hydrated anilin is separated and rises to the surface, whence it is to be removed and dried. It is sufficiently pure for medical purposes and yields a soft mass of crystals when mixed with sulphuric or muriatic acid, which dissolve in water. By this method, Béchamp states that in several trials he obtained as much anilin as equalled three-fourths of the nitro-benzole employed, and at a cost (in 1855) of two dollars a pound. (Chem. Gaz. vol. 13th, page 85).

Anilin when pure is a colorless, thin, oily liquid, but as usually seen in commerce has a more or less red color, sometimes as dark as bromine, arising from oxidation in part, and also from impurities. Its odor is peculiar; when pure not disagreeable, but often modified by other products so as to remind one of coal oil. Its density is stated as variously as 1.20 and 1.28. Its taste is acrid and pungent; it is but slightly soluble in water and does not crystallize at 4° below zero F. It boils at 360° F. and distills unchanged. It is a powerful base, forming salts, with a strong tendency to crystallize. Its basic power enables it to decompose the salts of iron, zinc, alumina, &c., like ammonia. It does not change the color of reddened litmus, or reddened turmeric, but changes dahlia blue to green. It oxidizes easily even under water, turning yellow, and then reddish, becoming resinous. It is easily characterized by instantly striking a deep violet blue by contact with chlorinated lime or other hypochlorites. It exerts no poisonous action on dogs. Eight grains introduced with a drachm and a half of water into the stomach of a rabbit caused strong clonic cramps, then laborious breathing, loss of strength, dilated pupils, and inflammation of the mucous membrane of the mouth. Dropped into the eye it does not dilate the pupil. (Hoffman in Gmelin's Hand-book, vol. xi. p. 249).

Preparation of Sulphate of Anilin.—Having obtained anilin by the foregoing or any other process, the sulphate is easily prepared by several processes.

Take of Anilin, as pure as possible.....500 grains.
" " Sulphuric acid.....250 "
" " Distilled water..... 4 fluid oz.

Mix the acid with the water, add the anilin and agitate them together until a thick magma is formed and the odor of anilin has nearly disappeared. This is now washed with strong alcohol until free acid and coloring matter is removed; then, having pressed the drained salt between the folds of white filtering paper, it is dried in the dark. If wanted in crystals, the white pulverulent sulphate thus obtained is dissolved in boiling alcohol, which is allowed to cool slowly in a covered vessel in a dark place; the crystals, when formed, should be drained on filtering paper and dried in the dark.

The sulphate may also be made by dissolving the anilin in two fluid ounces of alcohol, 95 per cent., then having mixed the sulphuric acid slowly with two fluid ounces of the same liquid, when cool add it to the solution of anilin. The sulphate thus formed is washed with cold, strong alcohol, pressed in bibulous paper, and dried in the dark.

Sulphate of anilin is an odorless, colorless crystalline salt when entirely pure, but when exposed to air and light, especially if moist, it changes color from the formation of fuscine, the odor of anilin being also apparent. The crystals may be dried at 212° without decomposition except a slight change of color, but at a higher temperature they lose first water and then anilin, and an acid salt remains, which on being yet further heated is decomposed, producing sulphite of anilin, ammonia and odorin, with a residue of carbonaceous matter. When a grain of the sulphate is put in 14 grains of water in a test tube, and repeatedly shaken for an hour, a slight residue remains undissolved, indicating that water at 60° dissolves about 6 per cent. Absolute alcohol, cold, dissolves it but slightly, but at the boiling temperature quite freely. Diluted alcohol is a better solvent; ether does not dissolve it at all. Water saturated at 212° solidifies on cooling. Its formula is C_{12} N H_8 O, SO_3 + HO.

Dr. Genth, of Philadelphia, who has recently turned his attention to the preparation of the anilin dyes, showed me a fine sample of the pure sulphate, which, if a demand should occur, can be furnished at three dollars an ounce, wholesale, at the Laboratory of Messrs. Andreykoviez and Poizat, 112 Arch street, Philadelphia.*—*Am. Journal Pharmacy.*

* This is an enormous price—more than the cost of a pound of pure anilin in Europe.

WHY A LAMP-WICK DOES NOT BURN.—If we take a piece of lamp-wicking and place it in the flame of a lamp it is immediately consumed, but the same kind of wicking placed in the lamp and lighted at the top, lasts the whole evening, and if the lamp is supplied with alcohol the wick is not even charred. The cause of this was a perfect mystery until a hundred years ago, when Dr. Black, of Glasgow, discovered the principle of latent heat. As the oil or the alcohol comes near the flame it is evaporated, and by this change in its form a large quantity of heat is destroyed, or rather is rendered latent, so that it does not manifest itself in any way. It requires a great quantity of heat to change a liquid into vapor, so that evaporation always cools surrounding objects. The wick is cooled by the evaporation of the oil or alcohol below the temperature at which it will combine with oxygen—in other words, below the temperature at which it will burn.

Dr. Black's discovery suggested to Watt his great improvement in the steam-engine; condensing the steam in a separate vessel from the cylinder. Watt attended Dr. Black's lectures.—*Scientific American.*

PORTABLE GAS TORCHES.—Hollow metallic canes, filled with compressed gas, are now used in some continental cities. The bearer has only to turn a small nipple, and apply his match, when he instantly finds himself furnished with a torch that will light him several hours.—*London Chemical News.*

ANNUAL MEETING OF THE NEW CITY GAS COMPANY OF MONTREAL.

The Annual Meeting of the Company was held on the 3d March instant, at their office, in Griffintown.

Thomas Molson, Esq., in the chair.

ANNUAL REPORT OF THE DIRECTORS TO THE SHAREHOLDERS OF THE NEW CITY GAS COMPANY.

The Directors have much pleasure in submitting for your consideration the Fifteenth Annual Report of the company's operations, and they trust that an inspection of its affairs will lead to the conclusion that the last year's working will compare favorably with the previous.

The Managing Director's Report now on the table, and the working account and balance sheet to 31st December last, it is hoped will be found sufficiently in detail to enable you to form a correct opinion of the position and prospects of the company.

Your attention is particularly directed to the report on the extensions and improvements of the works; and should you favor the directors by personally visiting and inspecting for yourselves the improvements that have been made during the last three years, they believe you will be satisfied as to the substantial character of the new works, and their adaptation to meet the increased demand for gas.

The company's working account and balance sheet now on the table have been audited, and are certified to be correct, as will appear from the report of the auditor, Mr. Gordon.

The directors have pleasure in stating that they have been able to declare a dividend of 4 per cent. for the past six months.

In accordance with the resolution of the last general meeting of shareholders, £25,000 of new stock has been issued, 50 per cent. of which has been called in.

The following directors retire by rotation, all of whom are eligible for re-election:—Hon. John Rose, R. Cassels, John Ostell, and William Macdonald.

All of which is respectfully submitted.

THOMAS MOLSON,
President.

Office of the New City Gas Company,
Montreal, 3d March, 1862.

MANAGING DIRECTOR'S REPORT.

To the President and Directors of the New City Gas Company:

Gentlemen,—In submitting for your consideration my report of the operations of the company, for the year ending 31st December last, the result shown will, I trust, on a careful comparison of the events that have marked its progress with those of the previous year, be found quite as favorable as could reasonably be expected.

Main Pipes and Services Laid and Altered.

A large amount of work has been done during the year in repairs, alterations and the laying of additional main pipe. In several of the large gas consuming districts, such as St. Joseph, St. Lawrence, and other streets requiring important extensions, a large number of 1¼ and 2 inch mains, formerly large enough, but on being required to act as feeders, they were found to be too small, and had to be taken up and replaced with pipes of a larger size. Much work of this nature has been successfully accomplished; a good deal, however, remains to be performed, and to which the company will continue to direct its efforts.

During the past year, 2,878 yards of pipe were lifted and replaced by larger sizes; 4,641 yards of new mains have been laid; 565 yards were lifted, cleaned, tarred, and relaid; 212 new service pipes were laid during the same period, but many of them being for buildings in course of erection, are only now coming into use, and will this year bring an increase of revenue to the company.

Number of Consumers and Street Lamps.

		STREET LAMPS.	CONSUMERS.
For the year ending 31st December,	1860	587	2,488
Do. do.	1861	604	2,584
Increase		17	96
The gas manufactured it 1860 was		48,760,000 cubic feet.	
Do. do. 1861 do.		46,735,000 do. do.	
Decrease		2,025,000 do. do.	

And which I think may, to a considerable extent, be accounted for by the stoppage of the company's works caused by the inundation of April last, and the large

demand required for the illumination during the visit of the Prince of Wales to this city in 1860.

Improvements and Extensions.

In my report of the previous year, allusion was made to various extensions to the works, and I have now much pleasure in stating that the greater portion of what was then recommended, and the execution of which the Board regarded as being urgently called for, has since been completed, and is now in successful operation.

A new wing, 70 feet square, substantially built of stone, and covered with slate, has been added to the former retort house. It is furnished with ventilators, also hydraulic mains, stand pipes, tar well, &c., all complete. Three arches have been erected of sufficient size to contain 10 retorts each, 2 benches of which are already built, the other has been reserved in order to test the working of long retorts, open at both ends, which are said to be more economical than the short ones. The new building is found to be a valuable addition to the company's works, and cost, including machinery, $7,817 07.

The coal shed, which formerly stood on the site occupied by the retort house, had to be removed to make way for it, and now occupies the ground between it and the new tank house, affording, however, the same space and facilities for storing coals.

Condensers.

A new set of condensers, constructed on the most modern principles, were imported during the last summer, and erected immediately adjoining the new retort house. They were of sufficient capacity for perfectly cooling and passing 500,000 cubic feet of gas per diem. They are constructed so as to admit of the cooling of the gas being regulated, thereby securing its passage to the purifiers at a proper temperature. The cost of the condensers is $3,941 12.

Steam Heating Apparatus.

For a considerable time past, the want of a safe and commodious mode of heating the company's works during the cold weather had been a source of considerble anxiety to the directors, and I have much pleasure in stating that the new apparatus ordered by you to be erected for that purpose, is now in successful operation; it works admirably, and so far this winter has exceeded what was expected from it. The boiler has been erected at the end of the benches in the new retort house, and the extra heat from the furnaces, instead of being wasted by passing direct to the chimney, will be conducted through the flues in the boiler and be sufficient to heat it from 15 @ 20 lbs. to the square inch, affording all the heat required for maintaining at a good temperature during the coldest weather, the old tank house, 160x80, the new one, 105 feet square, and new purifying house, 60x60. The whole of the buildings are now heated much more economically as regards fuel, and a great deal safer than on the old plan of open fires. The cost of the new heating apparatus is $1,547 45.

New Tile Drain.

An important improvement has been obtained in the construction of a new tile drain from the works, f.r the purpose of carrying off the waste water from the scrubbers; the very great expense connected with the removal of it by carting is now obviated. This work was completed last fall at a cost of $1,389 58.

A new governor or pressure regulator has been imported and is now on hand ready to be placed in position. An exhauster and large station meter have also been ordered, and are now in course of construction. They are expected to be here during midsummer, and when the improvements above referred to are added to the works, it is confidently expected they will possess a capacity and afford facilities for meeting any demand that may arise for gas for several years to come.

Complaints.

In compliance with the instructions of the Board, attention has lately been specially directed to the quality of gas produced during the early part of the winter, and the complaints which have been made have received their best and most careful consideration, with a view to furnish to consumers an article possessing the greatest amount of illuminating power. The excessive frost which set in and was long continued before the snow fell, was found, on examination, to have affected the pipes more injuriously than on any former occasion; no less than seven of our 3 and 4 inch main pipes were found to be broken in some of the principal parts of the city. The illuminating power is found to be greatly reduced by the unusually low temperature of the pipes through which the gas has to flow.

The company have also to contend with a great deal of remissness on the part of many consumers, in not more carefully protecting the exposed portion of their pipes from the frost during severe weather; a little more attention to this matter, and an occasional examination to see that the burners are not clogged up with grease and other substances, thereby arresting the flow of gas, would materially lessen the frequency of complaints.

Every effort will continue to be made to overcome the difficulties to which the climate and circumstances subject the company, and to furnish to their consumers gas of a quality not inferior to any produced in other cities.

Our city having been visited last summer by a distinguished artist, Mr. Philips, of New York, the directors availed themselves of the opportunity to acknowledge the valuable services rendered to the company by its President, Thomas Molson, Esq., and requested him kindly to allow of his portrait being painted by that gentleman, with a view to its being placed in the Hall of the company; and it affords me pleasure to say that you have now before you a portrait reflecting great credit on the skill of the artist, and, as a faithful likeness, could hardly be surpassed. It will, I hope, shortly appear in a more suitable apartment, arrangements being now in progress for enlarging the company's offices and affording the increased accommodation so much required.

In concluding my report I have the pleasure in again testifying to the zeal and efficiency with which the officers of the company have discharged their several duties.

All of which is respectfully submitted.

L. Beaudry,
Managing Director.

Office of the New City Gas Company,
Montreal, 27th February, 1862.

NEW CITY GAS COMPANY OF MONTREAL.

Working account from 31st December, 1860, to 31st December, 1861.

Dr.

To Coals carbonized, value		$86,409 52
" Salaries, &c		7,783 34
" Stokers and blacksmith, am't for wages	$8,804 00	
" Pipe layers and laborers, " "	5,341 75	
" Gas fitters, " "	2,065 53	
" Lamplighters (wages) and lamp fittings	3,268 02	
		19,479 30
" Retorts	1,715 48	
" Fire brick and clay	1,610 37	
		3,325 85
" Carpenters' and smith work, lumber, &c	480 42	
" Interest account	3,577 37	
" Insurance, water rent, &c	311 95	
" Ground rent	309 69	
" Corporation, for assessment, business, tax, &c	1,890 95	
		6,020 38
" Lime and baskets for purifying	1,041 30	
" Cartage account	1,282 13	
" Printing, advertising and stationery acc't.	744 66	
" High wines	311 97	
" Paints, oil, glass, &c	411 01	
" Hardware account	454 29	
" Castings	207 69	
" Auditor's services	100 00	
" Notarial and other professional services	95 15	
" Wear and tear, general	10,000 00	
" Removal of coal shed	609 50	
" Miscellaneous expenses	219 80	
		15,477 50
		88,495 89
Surplus		36,927 73
		$125,423 62

Cr.

By Gas rents, (revenue 1861)		$107,713 78
" Coke sales, &c		16,192 52
" Tar "		1,094 75
" Breeze "		150 50
" Sales old metal, &c		372 07
		$125,423 62

Thomas Molson,
President New City Gas Company.

George Robson,
Secretary.

E. & O. E.

Montreal, 31st December, 1861.

Certified to be correct—Alexander Gordon,
Auditor.

NEW CITY GAS COMPANY OF MONTREAL.

Balance Sheet, from 31st December, 1860, to 31st December, 1861.

Dr.

To Capital stock paid up		$299,240 00	
" New stock		43,203 20	
" Amount borrowed on interest		44,800 00	
Total capital of the company			387,243 20
" Amount of *Constitu (non rachetable)*		600 00	
" Bills payable		16,306 53	
" Dividends, amount unpaid		763 59	
" Capital and scrip certificate account		884 00	
" Open accounts, amount due		7,024 13	
			25,578 25
" Profit and loss account			19 983 44
			$432,804 89

Cr.

By Gas works		$835,389 16	
" Ann street property		3,014 89	
" New retort house	$7,817 07		
" New condensers	3,941 12		
" Steam heating apparatus	1,557 45		
" New tile drain	1,389 58		
" New station governor	464 35		
		15,169 57	
Total amount of General Outlay Account			353,573 62
" Cash on hand		5,713 53	
" Coals " value,		21,058 77	
" Meters " "		27,403 79	
" Iron pipe and tubing on hand "		7,533 19	
" Retorts, cast iron and clay " "		2,877 89	
" Fire bricks and clay " "		2,061 09	
" Coke " "		1,500 00	
" Open accounts		11,083 01	
			79,231 27
			$432,804 89

Thomas Molson,
President New City Gas Company.

George Robson,
Secretary.

E. & O. E.

Montreal, 31st December, 1861.

Certified to be correct—Alexander Gordon,
Auditor.

[Copy.]

28 St. Sacrament Street,
Montreal, February 13, 1862.

Gentlemen,—I beg leave respectfully to report that I have carefully examined the books of the New City Gas Company for the year ending 31st December, 1861. I have found them correctly kept; the various entries are duly justified by their corresponding vouchers, and the abstracts, signed by the Secretary and myself, present a correct summary of the business of the year, and of the state of the company's affairs at its close.

Tendering to all of you my best acknowledgments for the confidence you have repeatedly shown me,

I have the honor to be,
With much respect, Gentlemen,
Your very humble servant,
(Signed) Alexander Gordon.

To the President and Directors
of the New City Gas Company,
Montreal.

The Electric Light in Mining.—Messrs. Dumas and Benoit's apparatus consists essentially of three parts—a battery, a Ruhmkorff coil, and a Geissler tube—the whole arranged so as to produce a sufficient light to illuminate the miner, and allow him to work in atmospheres where other lights fail. The light produced is cold, or rather does not heat the tube in which it is produced, and gas has no access to it; it is quite isolated. The apparatus is as compact as ordinary lamps, and there is no injurious emanation. It can be lighted or extinguished at will. It can work for twelve consecutive hours without diminution, and without requiring any charge. The workman has only to agitate the carbon occasionally by means of a rod. The greatest difficulty consisted in being able to associate a battery of such intensity that the weight of the apparatus was as small as possible, the light produced of the greatest regularity, and its duration at least twelve hours. The present form of the apparatus, which may be still further diminished, is already so small that the miner can carry it without inconvenience, like a small carpet bag. The authors point out the advantages of such a mode of illumination, and state that the results obtained in using Becquerel's fluoressence-tubes have led to the expectation that the luminous effects may be greatly improved, both as to duration and intensity.—*Comptes Rendus.*

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THE
AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

PROPRIETOR, JOHN B. MURRAY. | EDITOR, C. ELTON BUCK.

MONDAY, DECEMBER 15, 1862.

On page 296 of volume III. we noticed at some length the proceedings in the Court of Chancery, in England, in the case of HILLS *v.* EVANS. The plaintiff, it will be remembered, is the patentee of the use of hydrated or precipitated oxides of iron, to effect the purification of gas from sulphuretted hydrogen. In our comments on the suit at that time reported, we quoted a few brief extracts from the opinion of the Lord Chancellor, in which the principles of the law of patents were very clearly laid down, and a very nice distinction drawn between what constitutes a veritable invention, and what is merely an assertion that certain results may follow if certain directions be complied with. Many so-called inventions belong to the latter category; and it was the existence of so many grants of patents based on claims of this nature which led to infringements of Mr. HILLS' patent, on the ground that it was invalid because it had been anticipated: whereas, the real state of the case was, that the patents in the same line prior to Mr. HILLS' invention, were most of them invalid from a want of that clear and distinct information which is alone evidence of a thorough familiarity with the subject, and a proof of real invention.

Mr. HILLS has lately been engaged in another suit with the United Gas-Light Company, of Liverpool, in which he claimed damages of the company for their having used bog iron ore, also known as bog ochre, in their purifyers. The plaintiff in this case insisted that the use of this bog ochre was an infringement of his patent; and that furthermore, his patent was additionally infringed by the company in revivifying the oxide of iron after it had been used in the purifying house, thus fitting it for use again. The defendants resisted the claims of the plaintiff, and asserted that the material they used did not contain precipitated oxide of iron; and that if it did, it was not an artificial oxide, but a natural formation, and therefore not within the provisions of the plaintiff's patent.

The Lord Chancellor, in his opinion of the case, reviewed the testimony which had been given, and very clearly laid down the positions held by the respective parties to the suit. His decision was not strictly in accordance with the claims of either party, but, taking a course midway between the demands of the litigants, he defined the rights of each in such a manner as must be commended by all advocates of justice. In the course of his opinion the Lord Chancellor speaks as follows:

"I hold, therefore, that while the defendants employ the bog ochre in its natural state, they use a native oxide of iron, which, whether it be hydrated only or hydrated and precipitated, is not within the plaintiff's patent, and no injunction can be granted against the use of it; but that when they use the ochre after it has been reoxidized, they use a material which is within the plaintiff's patent, being an artificial hydrated oxide, and this I restrain them from employing. The Vice-Chancellor granted an injunction to restrain the defendants from using the plaintiff's process or invention of reoxidation. I cannot grant any such injunction, because the plaintiff specifies and claims that process or discovery as applicable only to the renovating the purifying materials he describes; that is the hydrates or precipitated oxides which are within his patent; and, if this ochre be not one of such oxides, as I hold it to be not, the revivification of it is not within the plaintiff's specification. In fact, it is only by the defendants using that process, or some other process, of renovation, that the bog ochre is brought into the condition of being one of the plaintiff's patented purifying materials—that is, a hydrated or precipitated oxide artificially prepared or obtained. Therefore declare, that the user, by the defendants, of the bog ochre employed by them in the purification of gas, so long as the same is used in its native state or condition, is not an infringement of the plaintiff's patent; but, that the user of the same material in the purification of gas, after it has been reoxidized or renovated by the means described in the plaintiff's patent, or by any other means, is an infringement of the plaintiff's patent, and ought to be restrained by injunction, and restrain the same accordingly."

The present Lord Chancellor of England has a happy faculty—often wanting in judges—of expressing himself with a simplicity and perspicacity which is worthy of great praise. The opinion from which the above extract is quoted, as well as the one from which we made some extracts while commenting on a former suit of Mr. HILLS, referred to above, is a model of clearness; and as an interpretation of patent law it will be referred to in future cases where rival claimants may test their rights. It plainly defines the nature of the invention, and while care is taken to protect the patentee in all his immunities, nothing more than his legal rights are given to him, while the just dues of his opponent are as watchfully guarded.

Mr. HILLS has not been allowed much resting time in which to enjoy the emoluments arising from his discovery, for infringements have again and again been made upon his patent. His name has been before the courts in frequent instances during the period since his discovery was first made public. His patent for purifying gas by means of oxide of iron expires in November of next year, when the public will be allowed the use of his invention, and gas companies in large cities in England will not be slow to avail themselves of it.

The trustees of the British Museum seem to have a holy horror of gas-light. It will be remembered by our readers that more than a year ago the question of introducing gas into the museum was agitated, and the trustees applied to the late Mr. BRAIDWOOD, the superintendent of the London Fire Brigade, for advice on the subject. That gentleman thought gas would be dangerous on account of its "dessicating" influences, and he very sagely recommended the use of oils or candles instead. We made some remarks on this subject at the time. The agitations on the question of lighting the British Museum still continue, and as the trustees seem to be infected with this ridiculous dread of gas inside the building, it is now proposed to light it with gas-burners situated *outside* the windows, so arranged with reflectors as to throw the rays of light within—the same arrangement, we suppose, as is now adopted for lighting shop windows. In the present state of security which all sensible people feel respecting gas as an illuminating agent, such an idea seems simply silly, and entirely unworthy of any intelligent person. We hope the trustees may soon come to some decision in regard to the matter, for not only Englishmen, but all people of cultivation and education throughout the world feel an interest in anything concerning that matchless collection of curiosities—the British Museum,

It is said that veins of cannel and other gas coal have been discovered in the State of Indiana, and that the gas-yielding value of the coal is sufficient to make it an article of some value. This will be welcome news, not only to gas companies in that region, but also to consumers; for by having coal so near at hand, a great saving in freight may be anticipated, and consequent reductions in price, and increase of consumption.

MR. MASON JONES' ORATIONS.

A few weeks ago Mr. MASON JONES quietly appeared in this city, and announced his determination to repeat a few orations, which rumor said had been given with great effect abroad. Without any ostentatious display or rhetorical flourish, his advertisements were printed in the daily journals, and the people flocked to hear him. His first audiences were not remarkably large; but the impression he made upon them was a telling one, and they dispersed only to return again and bring their friends with them; and to-day Mr. JONES has only to announce another oration, and before night all available seats in the immense Academy of Music are bought up, and standing room is hardly to be obtained.

Mr. JONES' success lies in the charm of his delivery; in the musical undulations of his voice; in the power of his imagination; in the wonderful copiousness of his language, and in the ease and smoothness with which each word and syllable is enunciated. His style is graceful and florid, yet not so much so as to be chargeable with superflous ornamentation. Like the innumerable pieces which go to make up a beautiful mosaic, each word he utters seems to have been chosen and cut and polished with immediate reference to its proper position; and to substitute a synonym would be to spoil the symmetry of the whole. And yet not a note or a paper fetters the speaker's delivery. Standing before his audience he holds them enchained for fully two hours—at one moment convulsing them with laughter by the relation of some witty anecdote, and at another almost moving them to tears by the pathetic manner in which he relates some affecting incident connected with his subject. The orations on CURRAN and Dean SWIFT particularly pleased us. In the former, the different events of the great orator's life were vividly depicted, and his character portrayed with a master's hand. The lecture on Dean SWIFT was to us the most attractive of the course. Some have found fault with the orator for pronouncing such a eulogium on the witty Dean of St. Patrick's; but when we remember the savage violence which has distinguished the revilers of SWIFT from his own time to that of his most recent libeller, Mr. THACKERAY, the ardor with which Mr. JONES rushes to rescue him from the envenomed attacks of his foes, is characteristic of the warmth of an Irishman in the defence of what he holds dear. We have not space to go into the merits of Mr. JONES' orations as they deserve, but would remind those who have not heard him, that an evening cannot be spent in a pleasanter or more profitable manner than by attending when he delivers one of them. There is a tone of pure morality pervading these orations, and this is one of their greatest charms and chief recommendations.

FAIR HAVEN, CONN.—Gas-works have been constructed in this town by Mr. S. R. Dickson, who built the works at Galveston, Texas, Harlem, N. Y., and many other towns in this country. The capital stock of the company is $75,000: shares $50 each. About six and a half miles of main are laid, and gas is sold for $3 50 per thousand cubic feet.

NUMBER FIFTY-ONE WANTED.—One dollar each for five copies of No. Fifty-one of this JOURNAL (not 61 as printed) will be paid on application at these rooms.

ANSWERS TO CORRESPONDENTS.

J. F. of N. Y.—*We advise you to wait for a few months until the parties are fairly in the field. They have hardly begun operations yet, but we are assured they will be fully under way in a short time. Their address is the same as heretofore.*

L. J. R., of Mass.—*A thorough search at the Patent Office is the only sure way to solve the problem. There are parties that will do this for you, and the expense will not be great.*

C. J. H., of Pa.—*The gas-holder at the works at Point Breeze, Philadelphia, is the largest one in this country. We believe there is but one larger in the world.*

D. J. P., of Ky.—*Some engineers use a cement composed of 20 lbs. sulphate of lime (gypsum) made into a pulp with water, and added to 10 lbs. of iron borings saturated with a strong solution of sal ammoniac.*

G. F. S., of Ohio.—*We have refrained from expressing our opinion on the processes you mention for several reasons. One is, we would never speak in terms of thorough approbation of any new process without taking charge of the apparatus with our own hands, and manipulating it ourselves for a sufficient time to be assured of the working properties of the innovation. This, after all, is the only way to arrive at a satisfactory conclusion. There are so many of these rival processes, and they all promise such marvellous results that it is no wonder the engineers of many village works are awaiting anxiously in expectation of knowing something definite about them.*

J. D., of Mich.—*The numbers have been sent you by mail. Inform us at once if any copies fail to reach you in future.*

J. L. N., of Cal.—*The books you have are good treatises on the subject, and a careful perusal of them should make you pretty well acquainted with the art. We will attend to your request, and inform you of the results of our interview at the earliest possible moment.*

Messrs. Munn & Co.'s Patent Agencies.—We would call the particular attention of our readers to the advertisement of Messrs. Munn & Co., the well-known patent solicitors, which will be found in another column. This firm have acted as attorneys in securing upwards of seventeen thousand patents, which is ample evidence of their large experience in the business. The interior of Messrs. Munn & Co.'s office has almost the appearance of a National Patent Office, and the curious may there find much to interest them, by looking over the extensive collection of models and designs which fill the large cases around the room. The *Scientific American* is published by Messrs. Munn & Co., and it is deservedly considered the best mechanical paper extant.

Improvement in Gas-Meters.—Some of our readers may recollect our describing in 1858 a new gas-meter, invented by the late Samuel Clegg, and which was expected to be of considerable service in registering correctly the amount of gas consumed. That invention has been subsequently still further improved by Messrs. Bischoff, Brown & Co., of Langham Works, George street, Great Portland street, and a medal was awarded to them at the Great Exhibition for a wet meter which was "self-adjusting, with very little friction." We learn that what was anticipated of this meter has now actually been fulfilled, for under all circumstances it registers accurately the amount of gas consumed, and is well adapted for large buildings. At the Mansion House, where it was previously necessary on gala nights to have a pressure of 3 inches in the gas mains, on adopting Bischoff, Brown & Co.'s meter, the pressure required is now, it is said, only 1 inch, whereby a pleasanter light is obtained at less expense to the consumer, and leakage in the pipes is avoided by the gas company. The specification of the improvements made by Mr. Kromschroeder, the foreman of Messrs. Bischoff, Brown & Co., would not be readily understood without diagrams; but we may state that the invention is particularly applicable to that class of gas-meters in which the measuring drum consists of a series of eccentric measuring chambers, and in which a hollow floating cylinder is within the measuring drum.—*London Builder.*

Gas in Dutch Guiana.—The town of Parramabo in Dutch Guiana is about to be lighted with gas. The charter has been granted to a company composed partly of Hollanders and partly of residents of the town. Parramabo has about 13,000 inhabitants, and is a model of cleanliness and thrift, and no better field for gas-works can be found in South America.

TO GAS ENGINEERS.

A lot of second-hand castings for Gas-Works, consisting of Hydraulic Mains, Bridge, Stand and Socket Pipes (4-inch) for benches of 3 or 5 Retorts, in perfect order, and for sale cheap, by

Herring & Floyd,
740, 742 and 744 Greenwich st.,
New York.

PETROLEUM GAS IN NEW YORK.

A petroleum gas-work constructed by James E. Thomson, of Buffalo and Toronto, is now in operation at the St. Nicholas Hotel in this city. The retorts benches were fired up on Wednesday, December 3d, and we are informed they have been in operation since that time, furnishing the house with the entire quantity of gas used. It is said that the average consumption of petroleum is 6½ gallons per thousand feet of gas produced. One-foot burners are used, and the consumption of gas per night is about 12,600 cubic feet. This is the same process which is in use at the Stevenson House, St. Catharine, C. W., where gas is said to be produced at prices remarkably low, and to give great satisfaction on account of its high illuminating power.

The proprietors of the St. Nicholas Hotel have testified to the merits of the gas produced by Thomson's patent process, in the following letter:

Certificate of the Proprietors of the St. Nicholas Hotel, New York, in favor of Thomson's Patent Petroleum Gas:

St. Nicholas Hotel, New York,
December 10th, 1862.

The proprietors of the St. Nicholas Hotel, New York, have recently introduced into their establishment the process for the manufacture of illuminating gas from petroleum, patented by Mr. James Edward Thomson, of Buffalo and Toronto. The results which have been attained during a trial extending over one week, from Dec. 3d to Dec. 10th, are sufficient to warrant the proprietors in testifying to its excellence as an illuminator, and its comparative cheapness, even at the present high prices of petroleum.

These results establish the fact that, even with crude petroleum at fifty cents a gallon, the cost of lighting their establishment by means of Thomson's patented petroleum gas is less than one-half the cost of Manhattan gas, and with petroleum at twenty cents a gallon, the cost will be one-fourth that of Manhattan gas at $2.50 a thousand feet.

The patentee first commenced to make gas at one o'clock on Wednesday, 3d December, and succeeded in producing enough gas to supply the house from a single bench of three retorts the same night. The ordinary average consumption of the house is thirty-six thousand feet of Manhattan gas per day in the month of October. The average number of lights used daily exceeds two thousand five hundred (2,500). This trial having taken place in the month of December, which demands the largest consumption of gas, makes it the more satisfactory to the proprietors of the St. Nicholas Hotel to offer the patentee and the public this testimonial in favor of the new illuminator.

(Signed) John P. Treadwell, Virgil Whitcomb, } Proprietors.

Another Pretty Story Spoiled.—A contemporary publishes the following:

"The Albany, N. Y., Gas Company have refused to sell their coke, and determined to give it to the poor of the city. This handsome and beneficent conduct seems to disprove the old adage, that 'corporations have no souls.'"

The truth of the matter is this, as stated to us by an esteemed friend, an officer of the Albany Gas Company. He says:—"The report that we gave the coke away to the poor originated in a misapprehension, and in this way: As the price of coal increased, many of the 'well-to-do' people sent us at once for large quantities. We could have increased our price of the coke and still sold it. But we preferred not selling it in large quantities, as it would have deprived hundreds of families in the vicinity of the works, who have been our regular customers winter and summer, and who depend on us for their winter supply of fuel." This example of the Albany Gas Company is worthy of imitation, and we are sure they will never be the losers for their liberality.

NEW YORK SANITARY ASSOCIATION.

ANNUAL ELECTION OF OFFICERS—INTERESTING DISCUSSION ON VENTILATION.

A stated session of the New York Sanitary Association was held on Thursday evening, December 4, at the Cooper Institute, when the proceedings were of an unusually interesting character. In addition to the annual election of officers, an able lecture was delivered by Mr. Hyslop upon a subject of the utmost importance to the whole human race—a subject affecting the very vital principles of health—fresh air—in other words, ventilation. Robert H. McCurdy, Esq., in the chair.

THE ELECTION.

The balloting for the election of President, Vice-President, officers and council was the first proceeding in order. The following was the result:

President—Robert H. McCurdy.
First Vice-President—Dr. Alfred C. Post.
Second Vice-President—C. C. Wimple.
Corresponding Secretary—Dr. Elisha Harris.
Recording Secretary—Dr. W. B. Bibbins.
Treasurer—Nathaniel Hayden.

The following gentlemen were appointed for

COUNCIL.

Peter Cooper, Prosper M. Wetmore, Peter McMartin, Richard A. McCurdy, Isaac Wood, M.D., John H. Griscom, M.D., Stephen Smith, M.D., John P. Batchelder, M.D.

The President, on returning thanks for his election, said that the subject of health was of the greatest consequence to New York, and if the circumstances of any city were calculated to promote health, it was those of the city of New York. If the Sanitary Association had not hitherto done as much as might have been hoped, it was owing to many causes which they could not control, but especially owing to the war. But the workings of the Society had not been without the most beneficent effects in promoting in several ways the health of the city. And they had before them a future, in which he hoped their efforts would be still more successful than hitherto, especially on the laws which they hoped to get from the State, bearing upon the health of the city.

Gen. Prosper M. Wetmore proposed a resolution to the effect that the council be instructed to take such measures as they may deem expedient to obtain the necessary legislation for the promotion of the public health of the city of New York. Carried.

VENTILATION.

Mr. Hyslop, in commencing his lecture, said that if there was any subject which lacked attention it was that of ventilation, and that it concerned men, women and children to a degree which few had any idea of—indeed, few were impressed with the idea of the importance of pure air. Many think pure air is necessary, but, after all, the number is very small. The murder of a single individual would arrest the attention of the entire community, but thousands might be slaughtered for want of ventilation without attracting the least attention. The Legislature insists upon certain conditions in buildings before they are deemed safe from falling, but none as to the prevention of death from want of ventilation. Deaths from foul air cannot be called accidents—they are murders, only lacking the malicious motive. Men, women, and children should live the full period of years intended for them, but tens of thousands are swept away long before nature intended. The Legislature was therefore as much bound to insist upon conditions of ventilation as of conditions of safety from falling in all buildings for rich or poor. No house, no workshop, no office should be used without due regard to its conditions of ventilation. Mr. Hyslop gave a curious instance illustrative of the necessity of fresh air for instance. Some statistics had recently been collected in Lancashire, Manchester, Bolton, Preston and other cotton districts, by which it appeared that among those in the districts which had suffered most from the cotton famine there were fewer deaths than among those who had been in constant employment. He next referred to the trades which suffer most from confined unventilated rooms—namely, tailors, shoemakers, clerks—the clerks being the last lives which an insurance company will take. Yet the printers' life is shorter in the average than any of the above trades,

which ought not to be the case, as he can use his legs, stand up and move about, but he works amid so much gas, his office is often so confined and unventilated, that he is the greatest victim to foul air. The result is, his system is lowered, and this gives him a craving for stimulants — intoxicating drinks. Mr. Hyslop showed that the worst air is always on the lower floor lower in the body of the church, for instance, than in the galleries.

The lecturer then made an interesting series of experiments, illustrating the principle of ventilation. He first lit three bits of candle, covered them over with a glass shade, open at the top, but the lights soon became extinguished; for, while the foul air had a means of escape, there was no inlet for fresh air, in which alone light or life could continue. He next lit the candles once more, and slightly raised the shade, thereby admitting some fresh air, when the candle opposite the aperture continued to burn, while the two others in its immediate vicinity became soon extinguished. This showed most simply, but effectually, the necessity of an inlet for the supply of fresh air, as well as an outlet for the foul air. The lecturer then applied "McKennell's double current ventilator," which he inserted in the opening of the shade. The apparatus consists of a tube within a tube—the outer one admitting the fresh air, the inner carrying off the foul air. The candles now continued to burn, and the experiment was perfectly successful.

Dr. Griscom, Dr. Ordronaux, and other gentlemen present, seemed perfectly satisfied with the operation of the apparatus, and expressed themselves warmly in its favor.

A vote of thanks was accorded to the lecturer, and the meeting adjourned.

NAVAL FORCE OF THE UNITED STATES.

NAVAL FORCE AT DATE OF THE SECRETARY'S ANNUAL REPORT,

Descriptin.	*No.*	*Guns.*	*Tons.*
Old Navy	76	1,783	105,271
Purchased vessels	186	518	71,297
New vessels completed and under construction	52	256	41,448
Total	264	2,557	218,016
PRESENT NAVAL FORCE.			
Old Navy	74	1,691	100,068
Purchased vessels	180	688	86,910
Transferred from War and Treasury Departments	50	230	32,828
New vessels completed and under construction	123	659	120,290
Total	427	3,268	340,036
Increase since last reported	163	711	122,020

LOSSES BY SHIPWRECK AND IN BATTLE.

NAME.	CLASS.	GUNS.	TONNAGE	REMRAKS.
R. B. Forbes	Steamer	3	329	Wrecked February 1862, Coast of North Carolina.
Congress	Frigate	50	1867	In action with Merrimac, March 3, 1862.
Cumberland	Sloop	24	1726	Do. do.
Whitehall	Steamer	4	328	At Old Point March 9, 1862, by fire.
M. J. Carlton	Mortar Schr.	3	178	Attack on Forts Jackson and St. Philip, April 19, 1862.
Varuna	Steamer	9	1300	In action with rebel gunboats below New Orleans, April 24, 1862.
Sidney C. Jones	Mortar Schr.	3	245	Grounded below Vicksburg, and burnt to prevent falling into the hands of the enemy.
Island Bell	Steamer	2	123	Grounded in Appomattox riv'r June 1862, and burnt to prevent falling into the hands of the enemy.
Adriondack	Screw Sloop	9	1240	Wrecked near Abaco August 24 1862.
Henry Andrew	Steamer	3	177	Wrecked in a gale near Cape Henry August 23, 1862.
Sumter	Steam Ram	2	400	Grounded in Mississippi river and abandoned.
		112	7908	

ADDED SINCE MARCH 4, 1861.
(Exclusive of those lost.)

Description.	*No.*	*Guns.*	*Tons.*
By purchase	180	688	86,910
By transfer	50	230	32,828
By construction	123	659	120,290
Total	353	1,577	240,028

ADDED BY CONSTRUCTION.

Second class screw sloops-of-war	13	116	16,296
Screw gunboats	27	108	14,033
Side-wheel gunboats	39	296	36,367
Armored wooden vessels	12	65	20,893
Armored iron vessels	32	74	32,631
Total	123	659	120,290
IRON-CLAD NAVY.			
Seaboard.			
Armored wooden vessels	8	56	19,005
Armored iron vessels	20	42	22,611
Western Rivers.			
Armored wooden vessels	4	9	1,888
Armored wooden vessels (transferred from War Department)	10	122	6,284
Armored iron vessels	12	32	10,020
Total	54	261	59,808
NAVY ON WESTERN WATERS.			
Armored vessels	26	261	59,808
Wooden gunboats	18	79	6,880
Transports and ordnance steamers	10	2	9,000
Rams	5	24	11,200
Armed tugs	13	13	650
Total	72	379	87,038

When the vessels now under construction are completed the navy will consist of—

SAILING VESSELS.

Description	*No.*	*Guns.*	*Tons.*
Ships-of-the-line	6	504	16,094
Frigates	6	300	10,237
Sloops-of-war	16	289	14,305
Brigs	4	20	999
Ships, including store and receiving vessels	23	139	18,087
Schooners	20	69	5,821
Barks	18	92	8,432
Yachts	2	2	200
Total	104	1,415	74,175
STEAM VESSELS.			
Screw frigates	5	228	18,272
Screw sloops, first class	6	133	11,955
Screw sloops, second class	21	167	23,992
Screw gunboats (new)	27	108	14,033
Iron clad vessels	54	261	59,808
Side wheel frigates	4	49	5,003
Side wheel gunboats (new)	39	296	36,367
Side wheel gunboats (old Navy)	5	11	2,190
Screw steamers (purchased)	53	215	23,490
Side wheel steamers (purchased)	63	250	38,617
Screw steamers (old Navy)	6	27	2,590
Gunboats, transports, &c., transferred from other departments	40	108	26,544
Total	323	1,853	265,861
RECAPITULATION.			
Sailing vessels	104	1,415	74,175
Steam vessels	323	1,853	265,861
Total	427	3,268	340,036

The Secretary proceeds to say:

IRON-CLAD VESSELS.

The attention of this department was turned to the subject of iron-clad vessels immediately after the commencement of hostilities and the adoption of measures for the enlargement of the navy. It was a subject full of difficulty and doubt. Experiments upon a large scale of expense, both in England and France, if not resulting in absolute failure, had achieved but a limited and questionable success. Yet it was evident that a new and material element in maritime warfare was developing itself and demanded immediate attention. In this view I recommended to Congress, at its extra-session, on the 4th of July, 1861, the whole subject, and asked authority to organize a commission for investigation. Thirty days after this action on my part, Congress conferred the authority requested, and appropriated fifteen hundred thousand dollars for the construction of one or more iron-clad vessels upon such models as should receive the approval of the department. On the day after the law had been approved, the commission was constituted, and the department advertised for proposals. Of the various plans and propositions submitted, three vessels of different models were recommended by the board, which received the approval of the department. Contracts were forthwith made for constructing the Monitor, the Galena and the Ironsides. All of these vessels are now in the service. It was the intention and constant effort of the department and the contractors that the Monitor should be completed in the month of January, but there was delay in consequence of the difficulties incident to an undertaking of such novelty and magnitude, and there were also some slight defects which were, however, promptly remedied, and she left New York early in March, reaching Hampton Roads on the night of the 8th.

Her arrival, though, not as soon as anticipated, was most opportune and important. For some time the department had heard with great solicitude of the progress which the insurgents had made in armoring and equipping the large war-steamer Merrimac, which had fallen into their hands when Norfolk was abandoned. On the afternoon of the 8th of March this formidable vessel, heavily armored and armed, and fully prepared to operate both as a ram and a war-steamer, came down the Elizabeth river, accompanied by several smaller steamers, two of them partially armored, to attack the vessels of the blockading squadron that were in and about Hampton Roads. When the Merrimac and her attendants made their appearance, the Congress and the Cumberland, two sailing vessels, were anchored off Newport News, and the remaining vessels were in the vicinity of Fortress Monroe, some six miles distant. The Minnesota, the Roanoke, and the St. Lawrence got immediately under way and proceeded towards the scene of action.

* * * * *

Thus terminated the most remarkable naval combat of modern times, perhaps of any age. The fiercest and most formidable naval assault upon the power of the Union which has ever been made by the insurgents was heroically repelled, and a new era was opened in the history of maritime warfare.

Before the occurrence of these events, entertaining a conviction that at least one of the models of iron-clad vessels—that of the Monitor, an original invention of John Ericsson, of New York—would prove a successful experiment, and that it was particularly adapted to our harbor and coast defence, and service on the shallow waters of our seaboard, I estimated, in my annual report, last December, for the immediate construction of twenty iron-clad steamers. The House of Representatives promptly responded to this recommendation, and passed a bill "authorizing and empowering the Secretary of the Navy to cause to be constructed, by contract or otherwise, as he shall deem best for the public interest, not exceeding twenty-one iron-clad steam gun-boats." The Senate delayed action on this bill until February, when, foreseeing that the country would suffer from longer inaction, I addressed the Chairman of the Naval Committee of the Senate on the subject, and the result was the immediate passage of the bill which had originated in the House in December.

At the earliest practicable moment after the enactment of this law the department commenced entering into contracts for the construction of armed vessels, most of them on the plan of the Monitor.

The Galena, a less formidable vessel, was for some time under fire from plunging shot at Drury's Bluff, on James river. As yet the Ironsides, recently completed, has not been tested in action, but it is believed she will prove a formidable fighting vessel. That we might be prepared for extraordinary emergencies, it was deemed advisable to put armature on one of our steam frigates, and the Roanoke was selected for that purpose.

Whatever success may attend the large and costly armored ships of the Warrior class, which are being constructed by some of the maritime Powers of Europe cruising in deep waters, they can scarcely cause alarm here, for we have within the United States few harbors that are accessible to them, and for those few the government can always be prepared whenever a foreign war is imminent. It has been deemed advisable, however, that we should have a few large-sized armed cruisers, of great speed, for ocean service, as well as of the class of smaller vessels for coastwise and defensive operations.

In the construction of iron-clads of the Monitor class, the nautical qualities of the vessel have not been the governing object, for with light draught and heavy armament, high speed is not attainable. But they are adapted to the shallow waters of our coast and harbors, few of which are accessible to vessels of great magnitude. While the larger armored vessels, with their heavy armament, cannot nearly approach our shores, those of the Monitor class can penetrate even the inner waters, rivers, harbors, and bayous of our extented double coast.

SUBWAY FOR GAS AND WATER MAINS.—The Metropolitan Board of Works of London have concluded to construct a subway upwards of 1,200 yards in length, for gas and water mains, in a new street in Southwark.

PETROLEUM ITEMS.

MONTHLY EXPORTS OF PETROLEUM FROM PHILADELPHIA.—The monthly exports of petroleum from Philadelphia up to December 1st were as follows:

January	galls.	254,505	$53,290
February	"	3,686	1,785
March	"	369,094	89,570
April	"	145,575	25,730
May	"	192,462	29,519
June	"	97,375	11,963
July	"	272,450	35,994
August	"	156,120	26,088
September	"	385,904	55,447
October	"	185,757	33,557
November	"	271,450	70,398
Total	galls.	2,333,658	$373,341

During the month of November there were exported to France 109,924 gallons, valued at $22,028. The bark Vivid Light, which sailed last week, took out a cargo consisting of 2,669 barrels crude petroleum.

PETROLEUM IN SURGERY.—A patent has been issued in Paris for the preparation and application of new agents for stopping of hemorrhage, &c., in wounds. They consist of salts made from mineral and essential oils soluble in caustic potash or soda. They are prepared by taking coal oil, or Petroleum, and stirring it cold in about one-sixth of its weight of caustic soda. It is then allowed to settle for twelve hours, when it separates into two different layers, the lower one being called phenate of soda. The phenate of soda is run off by a tap in the bottom of the vessel in which it is formed. Phenates thus obtained, are applied to wounds to stop hemorrhage, as follows: If the wound has been produced by a cutting instrument, several folds of a surgeon's compress are dipped into the liquid and applied to the wound. "It neither causes pain nor irritation," says the inventor. The compress is pressed upon the wound, and the phenates freely applied on the outside with a rag. A second compress is then applied, and some times four are required, but seldom more. The phenate coagulates the albumen of the blood, and stops its further issue. If the hemorrage is caused by a bayonet or bullet, the phenate solution is injected two or three times into the wound, then the opening is stopped with lint soaked in the solution. The superiority of these phenates for wounds, is stated to be due, not only to the property which they possess of coagulating the blood, but also of their rendering the edges of the wound insensible, and causing the injured tissues to contract by acting upon them in a similar manner to tannic acid.

SALE OF PETROLEUM IN GERMANY.—A merchant at Frankfort-on-the-Maine has received lately from Mr. James McHenry, of London, and disposed of over nine thousand barrels of petroleum. Ten months ago it was not in use in that part of Germany.

DEATH OF LT. WESTERVELT.—Lt. Minthorne Westervelt, of the Marine Artillery, died a few days ago of fever caught in the Dismal Swamp. He was frequently at our office and thought he was recovering, but our fears, as expressed to him that the disease was too deep seated, proved too true.

PATENTS.

UNITED STATES

36,841.—J. H. Irwin, of Chicago, Ill, for Improvement in Lanterns:

I claim the combination of two flanges, b c, and plates, d, with the lamp, E, jacket, G, and lantern, A, in the manner herein shown and described.

I also claim having the cap, H, arranged below the upper extremities of the wick tubes, as herein shown and described.

36,844.—T. J. McGowan, of Cincinnati, Ohio, for Improvement in Pumps:

I claim providing the pump bucket, D, or any suitable part connected therewith, and the lower valve guard, I, or any part attached to it, with screws, or their equivalents, arranged in such a manner that all the working parts of the pump may, by a simple manipulation, be connected together, and simultaneously withdrawn from the pump cylinder, A, and also adjusted therein, substantially as and for the purpose herein specified.

36,846.—T. J. Kindleberger, of Springfield, Ohio, for Improvement in Water Wheels:

I claim, first, The wheel, B, placed within the cylinder, A, and composed of a plurality of parts, a a' a", three more or less, provided with buckets, D, formed of an inner tangential and inclined portion, c, and a horizontal and radial outer portion, d, in connection with the chutes, F, and cylindrical gate, G, all arranged substantially as and for the purpose specified.

Second, The arms, g, connecting to the gate by rods, f, said arms resting or bearing on the curved inclined ways, j, on the top of the cylinder, A, and the arms, g, turned upon the inclined ways, j, by means of the arm, m, attached to the shaft, n, and link, l, substantially as described.

36,862.—William Sewell, of New York City, for Improvement in Steam Pumps:

I claim the combined arrangement of the crank shaft, crank or cranks, cross-head and connecting rod or rods, substantially as and for the purpose herein specified.

36,863.—William Sewell, of New York City, for Improvement in Valves for Steam Pumps:

I claim, first, So constructing and applying the valve that its flexible portion or hinge is held at a point or in a line outside of the chamber which contains the valve, substantially as and for the purpose herein specified.

Second, The combination of the block, D, provided with dowels, d d, or their equivalents, the flange, c, and the cap, E, the whole applied in combination with the valve, C, and the opening, b, in the valve chamber, substantially as and for the purpose herein set forth.

36,939.—Abel Brear, of Saugatuck, Conn., for an Improved Apparatus for Raising and Forcing Water:

I claim, the apparatus composed of the vessel, A, pipe or opening, B, pipes, G D, cock, H, or its equivalent, and the two self-acting check valves, C E, the whole combined to operate substantially as herein specified.

36,940.—F. H. Brown, of Chicago, Ill., for an Improved Gas Regulator:

I claim, first, the bi-valve bellows, A, made, constructed, and operated as and for the purposes set forth.

Second, I claim tube, F, in combination with flange, a, and bellows, A, constructed and arranged as and for the purposes specified.

36,971.—John Taylor and R. W. Brown, of Westerly, R. I., for an Improvement in the Döbereiner Hydrogen Lighter:

We claim, first, The arrangement of the two openings, e1, and e2, and the surrounding lip, e3, or its equivalent, with the elastic valve, G, as and for the purpose herein set forth.

Second, The employment of the adjustable spring, H, in combination with the above, for the purpose described.

Third, The valve herein described, composed of india-rubber and coated with fine bronze powder or its equivalent, for the purpose set forth.

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REPORT OF THE PROCEEDINGS OF BOTH HOUSES OF PARLIAMENT ON THE METROPOLITAN GAS BILL.

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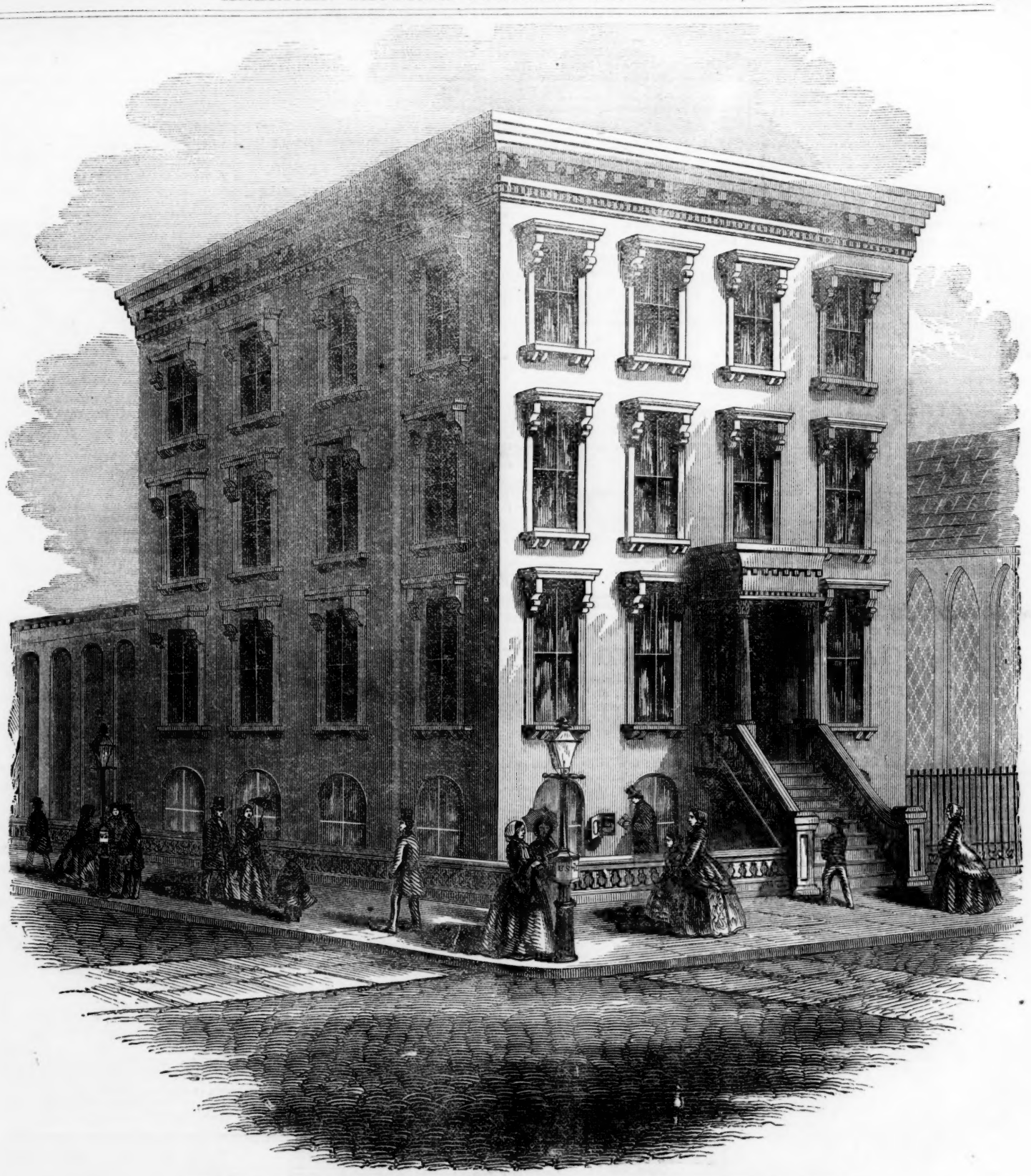

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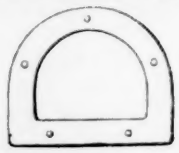

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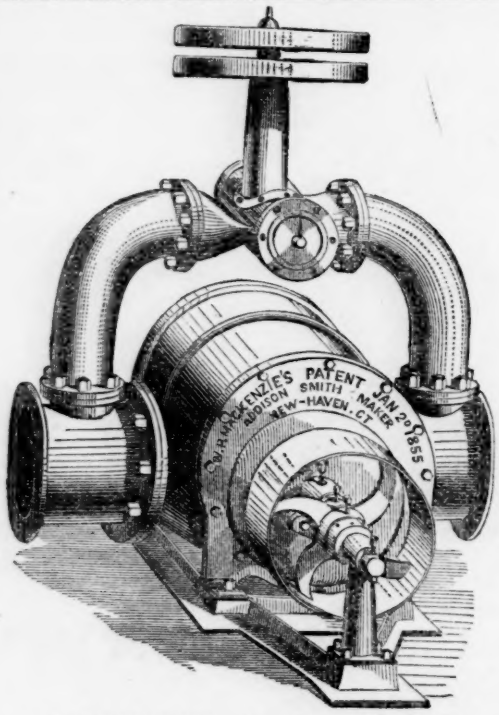

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PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

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For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

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PATENT BITUMENIZED PIPES for Water, Gas, and Drainage.—These pipes posses all the properties necessary for the conveyance of Gas, Water, and also for Drainage purposes, viz., great strength, great durability, and perfect inoxidability; and being non-conductors are not affected by frost, like metal pipes; they are proved to resist a pressure of 220 lbs. on the square inch (equal to 500-ft. head of water), and can be made up to any greater strength if required. They are only one-fourth the weight, and when laid down are fifty per cent. cheaper than iron pipes; they are made in 7 ft. lengths, and the joinings are simple and inexpensive.

These Pipes have been in use nearly three years, and have given the most perfect satisfaction.

Further particulars as to joining, &c., and specimen pipes, may be obtained by addressing
FREDERICK W. BOND,
58 Liberty street, New York.

POTTS' REVOLVING SIGNAL LIGHTS,

PATENTED SEPTEMBER 8, 1857.

Mr. ALBERT POTTS, the well known Inventor of the LAMP-POST LETTER-BOXES, which have been adopted by the Post-Office Department for the large cities of the United States—and also of the GAS METER BOX, to be set in the front walls of houses, thus doing away with visits from Gas Inspectors, or burglars in gas-clothing, has lately brought forward a third Invention, which, in point of importance and world-wide usefulness, surpasses the others entirely.

These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use there will be less likelihood of mistakes, and consequent collision, than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.

This Improvement in Lights for Steam Vessels consists in having the Lanterns containing the colored lights connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side-wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained from the paddle-wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination. and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof. In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle-wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the Lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling.

On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the aforesaid Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried. When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another, and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed. A very good proportion, would probably be to make the Laterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time, or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

RED LIGHT.				GREEN LIGHT.			
One Red,	Represents	Number	1.	Two Green,	Represents	Number	2.
Three do.	do.	do.	3.	Four do.	do.	do.	4.
Five do.	do.	do.	5.	Six do.	do	do.	6.
Seven do.	do.	do.	7.	Eight do.	do.	do.	8.
Nine do.	do.	do.	9.	One do.	do.	do.	0.

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign O, colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O,	
O, O, O, O, O, O, O.	
	O, O.
	O. O.

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O.	
O, O, O, O, O, O, O.	
	O, O.

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O, C, O, O, O.	
	O, O.
	O, O, O, O, O, O, O, O, O.

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O.	
	O, O, O, O, O, O.
	O.
O, O, O.	

Here the number expressed is 5603, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.)

Fig. 2

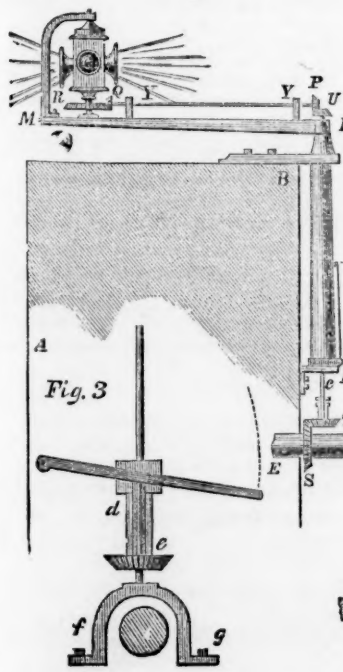

Fig. 3

(GREEN LIGHT)

Fig. 1

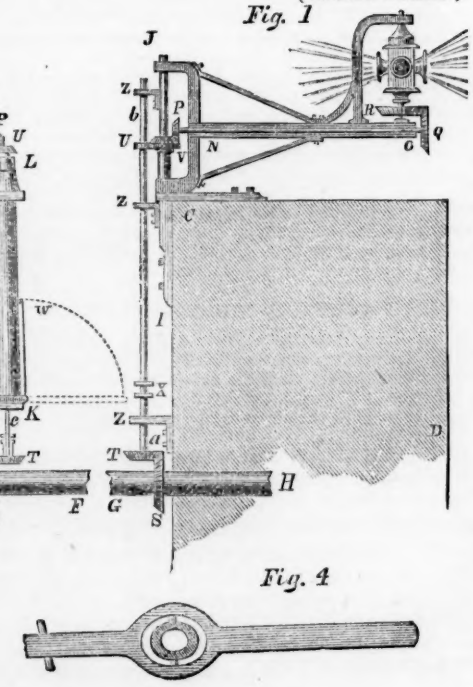

Fig. 4

MECHANICAL CONSTRUCTION.

In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft On the upper part of this post, is fitted the moveable arm or crane N O, to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O, may be operated by cords from the wheel-house, but in this device, the rod c U, does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

ALBERT POTTS, Patentee,
PHILADELPHIA, Pa.

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PATENT BITUMINIZED PIPES,

For the Conveyance of Water, Gas, and Drainage.

This important invention, patented by Mr. Charles Newbold, and now for the first time introduced to the public, may confidently be stated to be one of the greatest interest and commercial value, as the Patent Bituminized Pipes possess all the qualities necessary for the conveyance of Water, Gas, Sewage, Mine-Pumps, &c., viz.: great strength, great durability, and inoxidability, with the immense advantage of being about *one fifth* the weight of iron pipes, and about 35 per cent. cheaper; whilst, compared with lead pipes, the Bituminized Pipes are only about *one fourth* their price, without the possibility of the formation of the oxide and carbonate of lead, so dangerous for every purpose. They will stand 150 degrees of Heat, and after many trials it has been satisfactorily proved that rats or vermin will not touch them. They also withstand the action of all acids and salts.

Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

The Patent Bituminized Pipes are neutral, non-conductors of electricity, and consequently are not exposed to any of the deteriorating influences mentioned above. The process of manufacture of these Pipes consist in causing a roll of paper to pass through a reservoir of melted bitumen, after which it is tightly coiled around a mandril to any required thickness; and thus, when hardened, a tube is formed of perfect texture, great hardness, and enormous strength. These Pipes are proved, by hydraulic pressure, to resist a pressure of 220 lbs. to the square inch, equal to 506 feet head of water, which is more than double the altitude of the highest reservoir. The bituminous composition which unites and covers these Pipes is so well known as an excellent preservative, that it will be unnecessary to demonstrate that, when laid underground, the durability of the Patent Bituminized Pipes may be considered as unlimited. The Pipes are made in lengths of seven feet, and are connected by socket joints of the same material as the Pipes; or they can be fitted with iron flanged sockets, screwed together in a most simple and inexpensive manner.

For Gas these Pipes are invaluable; the Gas-lining which we insert effectualy resists the action of Gas, and being non-conductors, there can be no condensation in them, and the joints made with the Patent Cement are so strong as to entirely prevent Leakage.

The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last three years, for the conveyance of gas and have been ascertained to be as perfect now as when first laid down.

DIRECTIONS FOR JOINING THE PATENT BITUMINIZED PIPES.

Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stiring it as it cools until it becomes nearly as liquid as water; then pour quickly.

All Orders should be addressed to

THE AMERICAN BITUMINIZED PIPE COMPANY,

OFFICE 24 WATER STREET, BOSTON, MASS.,

J. McGEARY, AGENT;

or to FREDERICK W. BOND,

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